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Final Environmental Impact Statement

Moyer Salt Timber Sale

United States
Department of
Agriculture

Forest
Service

Salmon
National
Forest

Cobalt
Ranger
District

FINAL ENVIRONMENTAL IMPACT STATEMENT

Summary

Moyer Salt Timber Sale

Cobalt Ranger District
Salmon National Forest

Lemhi County, Idaho
1993

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Abstract: This Final Environmental Impact Statement documents the analysis of the effects of the proposed timber harvesting and related road construction in the 15,360 acre Moyer Salt Analysis Area. The proposed actions are designed to help achieve the silvicultural goals and objectives of the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan).

Seven alternatives, including a "no action" alternative were developed to respond to issues associated with the proposed action that were identified during the scoping process.

The action alternatives include, Alternative 2, as published in the Notice of Intent on October 1, 1990. This alternative would harvest 568 acres and 4.9 million board feet (MMBF) of mixed conifer and Douglas-fir stands with 16.8 miles of new roads. Alternative 3 was developed to address concerns on wildlife, particularly the key elk summer range. Alternative 4 emphasizes timber production and has the maximum amount of acreage proposed for harvest and the greatest number of roads. The next three alternatives (5, 6, and 2A) were developed between the Draft and Final EIS and respond to suggestions from the public during the 45 day comment period following the release of the Draft. Alternative 5 responds to a request for no road access for timber harvest. It has the least acreage proposed for harvest and the least amount of new road construction. Alternative 6, the preferred alternative, was developed to provide a balance between visual quality concerns and insect and disease conditions. It has the second highest amount of acres affected and the same number of new road construction as Alternative 2. Alternative 2A, is similar to Alternative 2, the original proposed alternative, but places special emphasis on visual quality.

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SUMMARY

MOYER SALT TIMBER SALE
FINAL ENVIRONMENTAL IMPACT STATEMENT

Salmon National Forest, Cobalt Ranger District
Lemhi County, Idaho
June, 1993

This Final Environmental Impact Statement (EIS) describes the direct, indirect and cumulative environmental effects of a proposal by the Forest Service to harvest timber and construct and reconstruct roads in the Moyer Salt analysis area.

This summary describes the purpose of the proposal, the identified issues, the alternatives developed in response to those issues, the monitoring and mitigation measures developed for the project, the affected environment in the analysis area, and briefly describes and compares the effects of the alternatives on the existing environment of the analysis area.

Copies of the Final EIS are available from the Salmon National Forest Supervisors Office and the Cobalt Ranger District of the Salmon National Forest, Highway 93 South, Salmon, ID 83467. The Moyer Salt Timber Sale project files are available for viewing at the Salmon National Forest Supervisors Office in Salmon, Idaho. Copies of the Final EIS will also be available in the public libraries in Salmon, Idaho; Challis, Idaho; and Darby, Montana. Copies will also be available for review at each of the Salmon National Forest Ranger District offices: at the Salmon District Office in Salmon; at the Cobalt Ranger District Summer Office in Cobalt, Idaho; at the North Fork Ranger District in North Fork, Idaho; and at the Leadore Ranger District in Leadore, Idaho.

THE PROPOSED ACTION

The Forest Service proposes to harvest timber in portions of the Moyer Creek, Salt Creek, Woodtick Creek, Goodluck Creek, and Pete's Gulch drainages in the Cobalt Ranger District of the Salmon National Forest. Six action alternatives for harvesting timber and a "No Action" alternative were developed and their effects analyzed in the environmental analysis. These alternatives represent a reasonable range of alternatives for implementing the proposed action, and were developed to respond to issues identified by the Forest Service and the public during the scoping process.

The timber harvesting and road construction activities that would take place under an action alternative would harvest as much as 847 acres on the Cobalt Ranger District of the Salmon National Forest, in a maximum of 32 units and construct a maximum of 17.8 miles of road. Trees harvested from these units would yield as much as 6.9 million board feet (mmbf) of timber.

The National Environmental Policy Act (NEPA) process was initiated for this project with the description of the Forest Service's proposed action in the Notice of Intent (NOI) published in the Federal Register on July 6, 1990. The timber harvest activities described in the NOI for the proposed action alternative (Alternative 2) included the harvesting of 4.9 million board feet (MMBF) from 568 acres using both clearcutting and

shelterwood harvesting techniques and involved building 16.8 miles of new road and the reconstruction of less than one mile of existing road.

PREFERRED ALTERNATIVE

The Forest Service has identified Alternative 6 as the preferred alternative for the Moyer Salt Timber Sale. Alternative 6 proposes to harvest 6.1 million board feet of timber on 747 acres and construct a maximum of 17.8 miles of road. There will be 30 harvest units in this alternative.

PURPOSE OF AND NEED FOR ACTION

The Final EIS was written in compliance with the National Environmental Policy Act (NEPA) and was prepared to disclose the effects of the proposed timber harvesting.

The proposed action alternatives were designed to implement the silvicultural objectives and goals of the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan). The purpose of the proposed timber harvest and road construction is to meet the following needs:

> The proposed action alternatives were designed to help provide a continuous flow of raw materials to dependent manufacturing communities and thereby provide community stability. It is also designed to enable the public to gather firewood. The proposed action is consistent with maintaining the customs and cultures of these communities.
>
> The proposed action alternatives were designed to improve the growth and vigor of the Forest through silvicultural treatments that would produce a more vigorous distribution of size and age classes of timber stands as well as increase the vegetative diversity of the Forest.
>
> The proposed action alternatives were designed to improve the health of the Forest by applying coordinated Forest insect and disease management strategies and techniques that would reduce damage and loss due to insects and diseases.

Long-term management direction for the Forest was established in the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan), approved in January, 1988. Among other things, the Forest Plan established the Desired Future Condition (DFC) of the Forest for all resources and uses of the Forest; Forest Plan multiple use goals and objectives, and management standards and guidelines to achieve them; monitoring and evaluation requirements to determine whether the goals and objectives are being met and standards and guidelines of the Forest Plan are being used; Management Areas, or sub-units of the Forest with similar management goals and a common management prescription; lands suited for timber management and the maximum amount of timber that may be sold from those lands. The proposed activities are designed to implement the Forest Plan.

SCOPE OF THE PROPOSED ACTION

The Moyer Salt and Salt Creek Timber Sale areas were determined to be suitable for timber harvesting and were delineated as timber sale areas in the 1988 Forest Plan. Site-specific timber harvesting and associated road construction can occur in this area only if the Salmon National Forest Supervisor makes a decision, based on the analysis documented in this EIS, to allow the Moyer Salt Timber Sale area to be entered for timber harvest. He will also decide how much timber would be harvested, what methods would be used, and what managements requirements, mitigation measures and monitoring activities would be required. The

scope of the proposed action is therefore limited to the specific timber harvesting, forest regeneration, road construction and reconstruction, and associated activities identified in Chapter II.

ISSUES

An interdisciplinary team (ID Team) with members representing various affected resources began identifying the issues related to implementation of the proposed action early in the NEPA process. Other agencies with jurisdiction in the analysis area were notified of the proposed action and invited to comment. Additional issues were identified by the public and interested organizations during the public involvement scoping process. Potential issues were analyzed by the Forest staff of resource specialists to determine if they were within the scope of the proposed project.

The following issues were identified as being within the scope of the proposed project and were used to direct the creation and evaluation of the alternatives:

Vegetation: This issues deals with several topics related to vegetation management, including: the effects to the age structure, species abundance and composition, and growth potential of the vegetation in the area; effects of the proposed action on the insect and disease susceptibility and the overall health of the forest stands; and the ability to manage the site productivity of these Management Areas (MAs) to ensure an adequate supply of timber for the timber products industry and the maintenance of employment and associated economic activity related to the harvesting and processing of timber.

The indices used to measure the effects of the alternatives on the vegetation in the area are: 1) the number of acres harvested; 2) the change in age class distribution before and after timber harvest; 3) the number of acres of trees harvested; and 3) timber outputs [volume production in million board feet (mmbf)].

Wildlife: Concern has been expressed about the potential effects of the proposed action on elk and deer, particularly elk and deer security and elk habitat. Protection of the area mapped as key elk summer range and the displacement of elk and deer from areas of preferred habitat are a concern, as are habitat parameters such as the cover to forage ratio and road density.

Potential effects of the proposed action on old growth-dependent species such as goshawk and pine marten, both of which require stands of trees with old-growth characteristics for nesting and/or hunting, is also a concern. These species could be affected by the proposed management activities, as stands with old-growth characteristics would be harvested under the action alternatives.

The indices of measurement that will be used to evaluate the effects of the alternatives on big game will be: 1) changes in Elk Habitat Potential (EHP) (derived from the cover to forage ratio and road density); 2) the effects to big game habitat security; and 3) elk vulnerablity. Effects to goshawk and pine marten will be measured by 1) the number of acres of timber stands with old growth characteristics within the analysis area before and after timber harvest; and 2) the number of acres of Forest Plan designated old-growth retention stands that are cut.

Roadless Character: Concern has been expressed about the potential effects of the proposed action on the Taylor Mountain Roadless Area. An estimated 9,920 acres of the 15,360-acre analysis area are located within the northern portion of the Taylor Mountain Roadless Area; the proposed activities would affect approximately 16 percent of the entire roadless area. The effects of road construction and tree harvest on the social, physical and biological attributes of the roadless area are a concern. Also, the effects to the potential candidacy of the analysis area for inclusion in the National Wilderness Preservation System (NWPS) is a concern.

The indices of measurement that will be used to measure the effects of the proposed action on the roadless character are: 1) whether or not the Taylor Mountain Roadless Area meets the qualifications for further consideration as a wilderness area; 2) number of acres within the inventoried roadless area boundary that would no longer be roadless; 3) the percent of the Taylor Mountain Roadless Area that is no longer roadless; and 4) the effects on the natural integrity, apparent naturalness, primitive recreation, solitude, special features, and special places and activities of the area.

Economic Efficiency: Concern has been raised that Forest management of timber resources, including the proposed project, is not economically efficient. Some members of the public are concerned that the proposed sale should result in long-term positive cash flow and that timber sales should contain the most efficient combination of logging methods, road systems, and silvicultural prescriptions.

The indices of measurement for comparison of the economic efficiency of the alternatives will be the results of the economic analysis for the timber sale that evaluates the costs and benefits of management alternatives, measured in terms of 1) present net value (PNV) and 2) the gross stumpage value realized.

Soil Resources: Concern has been expressed about the effects of the proposed activities on the soil resources, particularly effects to soil productivity due to increased sedimentation (and subsequent loss of soil), soil compaction and soil displacement due to road construction and log skidding, and potential for mass wasting of road cut and fill slopes. Increased soil erosion could lead to increased sediment in streams, degrading water quality and fish habitat. Roads and landing areas can commit the land to uses other than growing vegetation for extended periods of time (total soil resource commitment).

Indices for measurement of the effects to soils are: 1) acres of total soil resource commitment; and 2) percent of analysis area with total soil resource commitment.

Hydrology: This issue addresses the concern over effects of the proposed timber harvest activities on water quality or volume in streams in the analysis area. The importance of water quality to all beneficial uses downstream, including fisheries, recreation, and domestic and agricultural water has been recognized. The effects of vegetation removal on the timing and size of the peak flow rate are also a concern.

The indices of measurement to determine effects to water quality and volume are: 1) percent of drainages harvested; 2) meeting state water quality standards; and 3) maintaining beneficial uses.

Wetlands: The effects of the proposed timber sale on wetlands, particularly as they relate to water quality, was a concern expressed by some respondents during the scoping process. The importance of wetlands to maintaining water quality has been recognized, and concern was expressed that timber harvest and road construction would occur in wetland areas and affect this function. Recognition and delineation of wetlands was also recognized as important to maintaining wetlands. In addition, wetland areas serve as unique habitat for some species of wildlife.

The index of measurement to determine effects to wetlands is the acres of wetlands that are affected.

Fisheries: The effects of road construction and timber harvesting on resident and anadromous fish spawning, incubation, and rearing habitats is of great concern to the public and government agencies, including the National Marine Fisheries Service and the Columbia River Inter-Tribal Fish Commission. The spring-summer run of Chinook salmon has recently been listed as Threatened under the Endangered Species Act, and habitat for this fish species is present in the analysis area, although it is not currently being used. Effects to these species of fish or their habitat as a result of the proposed timber sale are therefore a concern.

The index of measurement for effects to fisheries is whether anadromous and resident fisheries habitat are maintained.

Biological Diversity: The effects of timber harvest activities on the variety, abundance, and distribution of plant and animal species, the primary components of biological diversity, is an issue arising from the accelerated extinction rate for animals and plants and an accompanying decrease in wildlife and plant habitat world-wide.

Threatened, Endangered, and Sensitive Species: Effects to federally listed threatened, endangered and sensitive species and to state-listed sensitive species is a concern for maintenance of both biological diversity and the wildlife resources of the area. Habitat for listed threatened spring/summer chinook is present in Moyer Creek and potential habitat is present in Woodtick Creek, although neither is used at present by this species because of downstream water pollution. In addition, a migration barrier presently exists at the mouth of Woodtick Creek. Several sensitive vertebrate species or their habitat are present in the analysis area, as well as sensitive plant species, and they could be affected by vegetation manipulation and road construction.

Potential habitat for the Endangered gray wolf exists in the area, although no wolves are known or suspected to occupy the area at this time. The entire area is included within the Central Idaho Wolf Recovery Area and may become important to this species at some point in the recovery process.

The indices of measurement of effects to these species are: 1) presence of threatened and endangered species or their habitat; and 2) effects to threatened, endangered or sensitive species or their habitat.

Visual Resources: This issue addresses the concern over visual disturbance from land management activities. Included in this issue is the concern about silvicultural methods used and their effect on the visual resource and the proximity to sensitive viewing areas such as the Moyer Creek Road and the Ridge Road.

The index of measurement of effects to visual resources is whether the visual quality objectives are met.

Recreation Resources: Concern over the effects of the proposed activities on the current recreation use in the analysis area is primarily related to big game hunting in the fall. Access to the area is limited, and recreation use other than big game hunting is light. The quality of the current recreation uses and the kinds of recreation opportunities would change as a result of the proposed timber harvest activities, and how that would affect the amount and types of recreation use is a concern.

The index of measurement of effects to recreation use is the number of acres converted from semi-primitive motorized and non-motorized to roaded-natural appearing.

Air Quality: The effects of the proposed timber harvest activities on the air quality of the analysis area focuses on the effects to the airshed during slash burning. Burning may cause the particulate content of the air to exceed state air quality standards and may affect persons travelling on the Ridge Road and other roads in the area.

The indices of measurement for air quality are whether the State air quality standards are exceeded.

Transportation and Access: Concern has been expressed that construction of the proposed transportation system may affect future use of the timber resource in the area because more timberland would be available for harvest. Concern has also been expressed over closing of the roads built for the timber sale and access changes to the area due to closing part of an existing primitive jeep trail (Moyer Peak jeep trail).

Indices for measurement of the effects of the different transportation systems proposed for the alternatives are: 1) the number of acres available for timber harvesting with the existing road system; 2) the number of acres available for timber harvesting with the proposed road systems; 3) the miles of road that would be constructed or reconstructed; and 4) miles of open road and closed road in the analysis area.

Minerals: This issue addresses the concern over the effects of timber harvest on access to and development of the mineral resources of the analysis area.

The index of measurement for effects to mineral resources is whether the proposed actions prohibit future mineral resources development in the area.

Cultural Resources: Concern for the effects to cultural resources in the analysis area addresses the effects of increased access into the area and the potential for vandalism of these resource. In addition, ground disturbance associated with the timber sale may affect cultural resources.

The index of measurement of effects to cultural resources is whether or not impacts will occur.

Range Resources: The issue of the effects of the proposed timber harvest on range resources reflects the concern that improving access and increasing forage may increase grazing in the area, or may reduce livestock use if fencing livestock out of areas is necessary. These changes can alter grazing levels, livestock use patterns, and rangeland conditions.

The index of measurement for range resources is the effects on range condition.

ALTERNATIVES

ALTERNATIVES CONSIDERED BUT NOT GIVEN DETAILED STUDY

The ID Team considered the following alternatives and options during the analysis process, but they eliminated them from detailed study for the reasons described below:

* **Use the preferred alternative identified in the Moyer Salt Environmental Assessment (1983) as the proposed action for this Draft EIS.**

In 1982 the Forest Service proposed timber harvesting and road construction in the Woodtick Creek and Salt Creek drainages (the Moyer Salt Timber Sale) that would harvest 4 to 8 mmbf from 1,000 to 1,400 acres. An Environmental Assessment (EA) was approved that documented an environmental evaluation of the proposed timber harvesting and road construction with a reasonable range of management action alternatives (U.S. Forest Service 1982). This evaluation did not assess the effects of the proposed action on the roadless character of the area. A Finding of No Significant Impact (FONSI) and Decision Notice were signed by the Forest Supervisor in May, 1983. The timber sale was marked and offered for sale but was not purchased due to depressed timber prices in the mid-1980s. In 1988 the Forest Plan was approved; it designated the Moyer Salt Timber Sale area as an area where timber harvesting could occur. In 1991 the decision was made to enter the area for timber harvesting. The timber harvesting and road construction activities proposed in the original Moyer Salt Timber Sale were modified to meet the current standards and guidelines of the Forest Plan, and are contained in the proposed alternative (Alternative II in this document).

- **Complete a separate EIS analysis for each of two timber sales originally proposed in the Moyer Salt Timber Sale EIS analysis area.**

As originally stated in the 1988 Forest Plan, two separate timber sales were proposed for what is now the Moyer Salt Timber Sale: the Moyer-Salt Timber Sale and the Salt Creek Timber Sale. These two timber sales were combined into a single sale, primarily to facilitate control of timing of road construction and timber harvesting in big game subdivisions. The two timber sales were not offered and their effects were not analyzed separately because: 1) this approach would not yield a clear disclosure of the potential environmental effects from the proposed action; 2) it would not be cost efficient; and 3) roads built to access the Salt Creek portion of the timber sale would also access the Moyer Salt portion; therefore, analyzing the effects of the two sales separately would be partially redundant and an inefficient use of time and resources.

- **Harvest timber only outside the Taylor Mountain Roadless Area.**

Comments to the DEIS suggested that we analyze this alternative. Our reason for dismissing further analysis follows. Nearly 50% of the Salmon National Forest's suitable timber base is located in roadless areas. The Forest Plan identified roadless lands within this analysis area as suitable for timber harvest. Failure to consider harvesting in roadless areas would lead to overcutting of nonroadless lands based on the current Allowable Sale Quantity. One of the purposes of this EIS is to address the effects of timber harvest activities on the roadless resource, thus this alternative would be outside the scope of this document. The No Action alternative approximates this alternative and if selected would allow the option to consider any number of timber sales outside the roadless area.

- **Prescribed burn alternative to address the forest health concerns.**

Due to public comments received after release of the DEIS, a prescribed burn alternative was considered but is outside the scope of this EIS because it does not meet the purpose of contributing, in part, to the Forest Plan objective of satisfying the commercial demand for timber. The Draft EIS, on page 1-1 states: "The proposed action alternatives are designed to help provide a continuous flow of raw materials to dependent manufacturing communities and thereby provide community stability. It is also designed to enable the public to gather firewood. All the proposed action alternatives are consistent with maintaining the customs and cultures of these communities."

- **Helicopter log 170 acres of Douglas-fir units and conventionally log 580 acres, requiring 15.8 miles of road (2.5 miles in Wildlife Area I and 13.3 miles in II) with an estimated yield of 6.0 MMBF.**

Due to public comments received after release of the DEIS, this alternative was considered but dropped from further analysis due to the increased costs of logging and transportation, and the relatively minor benefits to wildlife.

- **Helicopter logging the Douglas-fir units (170 acres) and conventionally log 170 acres, requiring 13.8 miles of road (only 0.5 miles of road in Wildlife area I to access heli-spot and all conventional units dropped in this area) with an estimated yield of 4.0 MMBF.**

This alternative like the previous one, was considered because of public comments received after release of the DEIS, but was dropped from further analysis due to the increased costs of logging and transportation, and the relatively minor benefits to wildlife.

ALTERNATIVES PROPOSED FOR THE MOYER SALT TIMBER SALE

Seven alternatives were developed, a no-action alternative and six action alternatives. Each action alternative represents a different combination of timber harvest and road building intensity, as well as slightly different methods for mitigating their effects. These alternatives were designed to meet the issues and concerns identified during scoping while at least partially meeting the purpose of and need for action defined previously, and represent a reasonable range of actions to accomplish those goals.

Harvest treatments prescribed for the proposed Moyer Salt Timber Sale apply even-aged silvicultural systems because these methods best meet the Management Area goals for the area established in the Forest Plan (pp. IV-32). Standard harvest methods for even-aged management of forests include clearcutting, seed tree, and shelterwood methods. Clearcutting and shelterwood or variations of the shelterwood system are the optimum even-aged silvicultural methods for treating stand conditions in the Moyer Salt analysis area.

Clearcut Harvest

Standard clearcutting would be applied in areas with heavy fuel loadings, where residual overstory or understory trees can't be protected while harvesting, in areas susceptible to windthrow, and in stands infected with dwarf mistletoe. These conditions are found on subalpine fir habitat types consisting of relatively pure stands of lodgepole pine or mixed stands of lodgepole pine, subalpine fir, and Engelmann spruce. Even when it is possible to skid logs and save a residual stand, it is often not possible to dispose of the slash without clearcutting. However, wherever feasible, healthy residual understory trees will be left. This method would be utilized in Alternatives 2, 3, 4, and 5.

Alternatives 6 and 2A would utilize clearcutting with islands in order to meet visual quality objectives and mitigate other resource concerns. Where clearcutting is prescribed, many of the stands would have approximately 15% of the area within the unit left in uncut islands ranging from 1/2 an acre to one acre in size. With heavy fuel loadings, such as those found in the analysis area, the retention of islands is the only practical and economically feasible alternative to standard clearcutting.

Regardless of which method is applied, there would be a variety of common treatments. Most units would be logged using tractor skidding methods; units with slopes too steep for tractor logging would be logged with a cable system.

After the trees have been removed from a site, a variety of activities would occur on the site that are designed to promote seedling establishment, improve timber stand conditions and reduce the amount of combustible material laying on the ground (fuel loading). Slash would be piled by tractors on sites with slopes less than 45 percent. In addition, ten to fifteen tons of slash would be left evenly scattered on each acre in order to provide microsites that enhance seedling establishment and survival, ensure long-term soil productivity and provide habitat for insects and animals. Any remaining unhealthy trees and insect-infected understory trees that were not pushed over during the piling process would be hand felled in order to increase growing space and completely remove any disease source. All remaining healthy understory trees would be maintained. Existing snags (large standing dead trees) and recruitment snags (trees that would be retained as future snags trees) would be maintained as per Forest Plan direction.

During logging, branches, tree tops, and small trees (slash) would be cut to lengths such that the slash would lie on the ground at depths of less than 1.5 feet. In some areas this material would be made available to the public and commercial firewood gatherers for a designated time period after logging operations are complete. After firewood gathering, the slash would be burned to increase available growing space, to reduce the amount of dead material on the ground and thereby to reduce potential for wildfires, and to assist in the

breakdown of woody material and increase soil productivity. Clearcut units on slopes steeper than 45 percent would be broadcast burned (burned without piling); on slopes less than 45 percent the slash would be burned in piles. Firelines would be constructed around harvest units to reduce the possibilities of fire escape during burning. Burning would be controlled so that 10 to 15 tons per acre of slash material, including larger diameter pieces of slash, would be retained to provide microsite protection, ensure soil productivity and maintain habitat for those organisms requiring down woody debris.

Natural seed sprouting would reforest the clearcut units. Natural seeding and regeneration of timber harvest cutting units on similar sites elsewhere in the Salmon National Forest has been successful. Clearcuts would be planted if reforestation by natural means is not successful. Timing of harvesting and slash disposal would be adjusted to ensure that the pine cones have dropped their seeds before the slash is piled.

Machine site preparation such as scarification would be used in units where grasses, sedges, or shrubs are present that may prevent or prolong seedling establishment. On approximately 50 to 100 acres of clearcutting units, a specially designed tractor blade will be used to overturn the sod layer and to loosen the top soil of an area in order to create a mineral soil seedbed where tree seeds can germinate.

Shelterwood Harvest

In stands where there are no young trees present on the site or where those that are present are unhealthy (they are infested with insects and diseases or will not grow if the competing trees are removed), a standard shelterwood method would be uniformly implemented (designated as "shelterwood" on Alternative maps). The initial entry would apply the seed cut of the shelterwood in which approximately fifty to seventy percent of the overstory depending on site conditions. The remaining "leave trees" would be expected to regenerate the site within 10-15 years. The actual time necessary to regenerate these sites would vary depending upon whether the topography was suitable for the application of machine scarification. Once regeneration is established, a removal cut of the shelter wood would be made leaving three to five large trees per acre for snag replacement or future harvest.

In stands where there are healthy young trees on the site that will grow if competing trees are removed, a group shelterwood method would be implemented (designated as group shelterwood on maps). Stands where this method is proposed are characterized by three distinct components:

1. A Douglas-fir overstory with an understory of Douglas-fir seedlings and saplings ranging from two to six feet tall;
2. A Douglas-fir overstory with an occasional clump of regeneration but generally park like in appearance;
3. Thick patches of advanced Douglas-fir regeneration (pole size material 3.0 - 8.9 inches DBH).

These three components create a mosaic of even-aged groups. The objective of the group shelterwood method is to maintain these components as even-aged groups, thereby replicating nature's reproduction system. In the initial entry, this method takes advantage of the existing regeneration present. Where a suitable understory is present, a removal cut of the shelterwood would be performed to release existing regeneration. Where regeneration is lacking, the seed cut of a shelterwood would be implemented removing approximately 50 to 70 percent of the overstory depending on site conditions. Where existing patches of Douglas-fir regeneration is encountered a combination of precommercial and commercial thinning would be applied.

In order to meet visual quality objectives and mitigate other resource concerns, many of the units in Alternatives 5, 6 and 2A will be treated utilizing a modified irregular shelterwood system (designated "irregular shelterwood" on the Alternative maps). This method would be initially similar to the standard and group shelterwood methods described for Alternatives 2, 3 and 4. The primary difference is that the shelterwood

trees are retained longer than necessary for seedling establishment thus delaying the timing of the second entry into the stand. The removal cut (second entry) of the shelterwood, would not be performed until the average height of the regeneration is approximately 20 feet. The removal cut would therefore occur approximately 20 to 30 years after the seed cut as compared to 10 to 15 years when employing the standard or group shelterwood.

Regardless of which method is applied there would be a variety of common treatments. Most units would be logged using tractor skidding methods. Units with slopes greater than 45 percent would be logged using a cable system.

Machine scarification and slash piling by dozer would be performed as one operation in areas where a shelterwood seed cut is made. Fifty percent of these areas would be scarified by alternating strips of treated and untreated ground. Slash would be lopped and scattered prior to the scarification process. It would be evenly redistributed during the scarification process. These treatments would not be possible under Alternative 5 due to lack of road access. In cable units that are too steep to pile or scarify, the slash would be lopped and scattered or jackpot burned (areas where slash has accumulated in piles (jackpots) would be burned). In areas where a removal cut, slash would be lopped and scattered. No piling or burning would occur in order to protect healthy trees present on the site.

Young trees left in shelterwood units would be thinned (a cutting is made in the overstocked stands to bring stocking to the desired level and to increase growth in remaining trees). Trees that are damaged or unhealthy would be cut down by hand in order to provide growing space for new trees.

ALTERNATIVE 1 - NO ACTION

The No Action alternative would not initiate any activities; present resource management activities would continue, but the proposed project activities would not be implemented.

The goal of this alternative is to maintain the area's undeveloped condition and current uses (see Figure II-1). This alternative provides a baseline to compare the effects of the action alternatives, and responds to the roadless issue, or the desire to maintain the area in a roadless condition. Because the existing environment is not static, environmental consequences will still occur; natural events such as wildfire, insect and disease infestations, or flooding could appreciably alter most of the resources that are discussed in this document.

ALTERNATIVE 2

This alternative was used in the internal and public scoping process in an effort to implement Forest Plan direction and to identify issues which other alternatives are designed to address. This alternative emphasizes timber harvesting and natural regeneration that would improve the health and vigor of the forest while meeting all other resource needs.

Sale layout would be designed to meet resource objectives by limiting unit size, shape, and total acres treated. Optimum treatment of insect and disease conditions, and economic efficiency of harvesting may not occur in order that standards and guidelines for other resources may be met. Emphasis would be on maximizing sawlog production for those areas treated. In this alternative, the entire area would be accessed from one road, an extension of Forest Service Road 106 (Swan Peak Road) (Figure II-2).

Total area that would be treated (acres)	568
Total volume that would be harvested (mmbf)	4.9
Miles of road	
Constructed:	16.8
Reconstructed:	1.3
Number of cutting units	
Douglas-fir	7
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25
Clearcut Cutting Methods:	
Amount clearcut (acres)	410
Logging Methods:	
tractor (acres)	400
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	310
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	158
Logging Methods:	
tractor (acres)	144
cable (acres)	14
Slash Disposal Method:	
piled and burned (acres)	*
broadcast burned (acres)	0
Machine Scarification (acres)	144

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286 C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

ALTERNATIVE 3

This alternative was developed to respond to concerns about the effects of the proposed action on wildlife, in particular the effects on key elk summer range. This alternative was developed with substantive input provided during the public comment period by members of the public .

This alternative eliminates 11 clearcuts totaling 170 acres contained in Alternative II and adds two clearcuts totaling 30 acres (Figure II-3). Access to the analysis area would be from two roads: cutting units in the Woodtick Creek area would be accessed by a road extending from the existing F.S. Road 106, and those in the Salt Creek and "Perm" Creek area would be accessed by a road extending from existing F.S. Road 107. The existing roads would be reconstructed to Forest road specifications. This configuration, with fewer clearcuts and access by two roads, would provide a large area in the center of the analysis area in which no harvesting or road building would take place.

Total area that would be treated (acres)	440
Total volume that would be harvested (mmbf)	3.75
Miles of road	
Constructed:	14.6
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	9
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	16
Clearcut Cutting Methods:	
Amount clearcut (acres)	270
Logging Methods:	
tractor (acres)	260
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	150
broadcast burned (acres)	120
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	170
Logging Methods:	
tractor (acres)	144
cable (acres)	26
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	144

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

ALTERNATIVE 4

This alternative was developed to respond to concerns about the economic viability of the other action alternatives and their effectiveness in treating insect and disease conditions within the project area. Alternative 4 implements the timber management direction of the Forest Plan to its fullest and may not meet resource objectives for other resources.

Most of the cable logging units contained in Alternatives 2 and 3 would be eliminated in order to increase the economic efficiency of the proposed action (Figure II-4). Cutting unit size was determined by Forest Plan Silvicultural and Insect and Disease standards and guidelines that are designed to maximize growth, health, and vigor and minimize insect and disease infestation of the treated stands. Clearcut cutting unit size may reach 60 acres in lodgepole pine stands where dwarf mistletoe levels are high (unit # 22). Shelterwood unit size in Douglas-fir stands, designed to control Douglas-fir beetle an I Western spruce budworm, would exceed 40 acres (unit # 30). The size of these units was determined by the amount and size of existing natural regeneration and the size of natural openings used by big game.

Total area that would be treated (acres)	847
Total volume that would be harvested (mmbf)	6.9
Miles of road	
Constructed:	17.8
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	5
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25
Clearcut Cutting Methods:	
Amount clearcut (acres)	645
Logging Methods:	
tractor (acres)	645
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	545
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	202
Logging Methods:	
tractor (acres)	202
cable (acres)	0
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	202

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

ALTERNATIVE 5

This alternative was developed in response to comments received on the DEIS. It is intended to respond to requests that "a no roads access for timber harvest" be considered and that an alternative be considered that "addresses harvesting less than 3.0 MMBF and constructing less than 10 miles of road.

This alternative contains 4 clearcuts and 3 shelterwood units totaling approximately 292 acres (Figure II-5). Access to the analysis area would be from existing F.S. Road 107. The existing roads would be reconstructed to Forest road specifications. Approximately 1.15 miles of new roads would be required to facilitate harvest. Units 1W, 2W, 3W and 4W would be tractor logged clearcuts while units S6, S11, and 30 would be helicopter logged utilizing the standard and irregular shelterwood silvicultural methods. Shelterwood harvest units contained in Alternatives 2, 3 and 4 include machine scarification and slash piling as part of the prescribed silvicultural system. These treatments would not be possible under this alternative due to lack of road access. The inability to perform machine scarification and slash piling will result in delayed regeneration periods and fuel loadings that may hinder big game movement (please refer to chapter IV - Environmental Consequences for a full disclosure of effects).

Total area that would be treated (acres)	292
Total volume that would be harvested (mmbf)	1.79
Miles of road	
Constructed:	1.15
Reconstructed:	8.0
Number of cutting units	
Douglas-fir	3
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	4
Clearcut Cutting Methods:	
Amount clearcut (acres)	124
Logging Methods:	
tractor (acres)	124
helicopter (acres)	0
Slash Disposal Method:	
piled and burned (acres)	124
broadcast burned (acres)	0
Machine Scarification (acres)	0
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	168
Logging Methods:	
tractor (acres)	0
helicopter (acres)	168
Slash Disposal Method:	
lop and scatter	168
broadcast burned	0
Machine Scarification (acres)	0

In addition to the mitigation measures common to all the action alternatives, the following mitigations apply:

1. The helicopter service landing will have an impermeable liner placed under the fuel storage area;
2. A physical barrier of sufficient height to contain any spilled hazardous substance will be placed around the helicopter service landing; and
3. Restrict fuel hauling for the helicopter to trucks without a trailer.

ALTERNATIVE 6 (PREFERRED)

This alternative was developed in order to provide a balance between concerns for visual quality and insect and disease conditions (Figure II-6). In the lodgepole community where clearcutting is proposed, Forest Plan standards and guidelines for visual quality would be achieved through a combination of unit size and leaving uncut islands (where slopes permit approximately 15% of the area within the clearcuts would be left in uncut islands ranging from 1/2 to 1 acre in size). Where necessary to meet visual quality objectives in the Douglas-fir community, timber stands would be harvested using an irregular shelterwood method. This method takes advantage of existing natural regeneration and in some cases will maintain four distinct age classes and canopy levels.

The island concept would be feasible in 16 of the 26 proposed clearcuts (units 1W, 2W, 3W, 4W, 13, 19, 19A, 19B, 20, 21, 22, 23, 25, 26, 28, S12). Leaving islands within units containing steep slopes and heavy fuel loadings (as in Alternative 2A) would not be attempted. Units 22 and 23 will leave approximately 30% of the area within the clearcuts in islands approximately 1 acre in size. The other units mentioned above will have approximately 15% of the area within the clearcuts in islands approximately 1 acre in size. As an example unit 22 (20 acres) would have approximately 6 islands designated (1 acre in size) thus the treated area would be reduced to 14 acres. Unit 1W (23 acres) would have approximately 3 islands designated (1 acre in size) thus the treated area would be reduced to approximately 20 acres.

The purpose of leaving the islands is five-fold:

1. Provide a regenerated stand that more closely approximates the species mix currently occupying the site;
2. To break up the units in order to provide a more visually pleasing setting when seen from a background or landscape view;
3. Provide big game bedding sites within the newly created forage area;
4. Break up site distances within the units to increase security and thus use by big game; and
5. Ensure protection of snags and retention trees that may otherwise be pushed over or damaged during the skidding and piling process.

Total area within harvest units (acres)	815
Total area that would be treated (acres)	747
Total volume that would be harvested (mmbf)	6.10
Miles of road	
Constructed:	17.8
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	4
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	26

Clearcut Cutting Methods:	
Amount clearcut (acres)	545
Logging Methods:	
tractor (acres)	545
cable (acres)	0
Slash Disposal Mothod:	
piled and burned (acres)	445
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Methods:	
Amount Shelterwood (acres)	202
Logging Methods:	
tractor (acres)	202
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	*
broadcast burned (acres)	0
Machine Scarification (acres)	202

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

ALTERNATIVE 2A

This alternative was developed to respond to concerns about visual quality. It is designed to mitigate the visual effects of timber harvest when viewed from a landscape or background view. All harvest units meet Forest Plan standards and guidelines for visual quality in terms of size. The unit sizes and locations are basically the same as Alternative 2 (Figure II-2A). However, where slopes permit, from 10% to 30% of the area within the clearcuts would be left in uncut islands ranging from approximately 1/2 to 1 acre in size. In addition, releasable residual understory trees that are free from disease will be left in all clearcuts. In the Douglas-fir community, timber stands would be harvested using an irregular shelterwood method. One key feature of this method is the delay of the removal cut until the average height of the regeneration is approximately 20 feet.

The island concept would be utilized in 24 of the 26 proposed clearcuts (units 27A and 28A are small cable where no islands would be left). As an example unit 19A (18 acres) would have 5 islands designated (approximately 1 acre in size) thus the treated area would be reduced to 14 acres, a reduction of approximately 30%. Unit 26 (9 acres) would have 2 islands designated (approximately 1/2 acre in size) thus the treated area would be reduced to approximately 8 acres, a reduction of approximately 10%. In units with heavy fuel loadings and steep slopes, some islands would be destroyed during the slash piling or burning processes. The degree to which the residual understory will be maintained will depend upon slope, fuel loading, and the condition of the understory.

The main purpose of the leaving the islands is to break up the units in order to provide a more visually pleasing setting when seen from a background or landscape view. However the islands do provide other benefits which include:

1. Provide a regenerated stand that more closely approximates the species mix currently occupying the site;
2. Provide big game bedding sites within the newly created forage area;
3. Break up site distances within the units to increase security and thus use by big game; and
4. Ensure protection of snags and retention trees that may otherwise be pushed over or damaged during the skidding and piling process.

Total area within harvest units (acres)	560
Total area that would be treated (acres)	502
Total volume that would be harvested (mmbf)	4.20
Miles of road	
Constructed:	16.8
Reconstructed:	1.3
Number of cutting units	
Douglas-fir	7
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25

Clearcut Cutting Methods:	
Amount clearcut (acres)	344
Logging Methods:	
tractor (acres)	334
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	244
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	158
Logging Methods:	
tractor (acres)	144
cable (acres)	14
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	144

* - slash will lopped, scattered, and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

MANAGEMENT AND MITIGATION

Site-specific management and mitigation measures were developed by the ID Team for each of the resources in the Moyer Salt and Salt Creek Timber Sale analysis area are listed in Table II-1 in the Final EIS. These measures were developed by applying various State and Federal standards and guidelines and Best Management Practices that govern how timber harvesting and road construction are implemented to the site-specific conditions that occur in the analysis area. The sources for the various management and mitigation measures include the Forest Plan; various Forest Service Manuals that give direction for protection of soils, water, fisheries and other resources; state management guidelines; and various other sources.

MONITORING

The Salmon National Forest has developed a plan to monitor and evaluate implementation of the Forest Plan, monitor the effectiveness of management practices implemented under the Forest Plan, and validate the assumptions and models used in planning (Forest Plan, V-2-19). This would allow the evaluation of progress toward achieving the goals, objectives, and standards of the Forest Plan.

A site-specific monitoring program of activities on the Forest is performed annually; not all activities on the Forest are monitored on an annual basis, and not all of the Forest Plan monitoring requirements are performed for each project. Results of the monitoring program are presented in an annual Forest Plan Monitoring and Evaluation Report.

Project-specific monitoring for some resources would be conducted on the proposed timber sale during timber harvest and road construction to ensure that implementation is consistent with the established standards and guidelines, specifically those outlined in the timber sale contract. Monitoring is also conducted during and after sale implementation to determine the effectiveness of management activities and applied mitigation measures developed specifically for the Moyer Salt Timber Sale. These monitoring measures are described in Chapter II of the Final EIS.

AFFECTED ENVIRONMENT

The existing condition of the environment that would be affected by the action alternatives was analyzed to provide a baseline for comparison of the effects on the environment as a result of project activities. The existing environment of the area affected by the proposed action is described in detail in the Final EIS in terms of specific resources, including: soils, hydrology, fisheries, vegetation, wildlife, Threatened, Endangered and Sensitive Species, roadless area, visuals, recreation, range, transportation, minerals, cultural resources, air quality, and economic efficiency.

The analysis area for the Moyer Salt Timber Sale is located in the Salmon National Forest on the Cobalt Ranger District. It is located about 22 miles southwest of Salmon, Idaho, in the Salmon River Mountains, in the east-central portion of Idaho (Figure I-1). The area of analysis lies between the Woodtick Creek drainage on the north, the Moyer Creek drainage on the west, Moyer Peak on the south, and the Salmon River Mountain Road (F. S. Road 020) on the east (Figure I-2).

Soil Resources: Soils throughout the analysis area are loamy sands and sandy loams developed from the Yellowjacket quartzite. Clay content varies but is generally low. Coarse fragments (gravel, cobbles, and stones) make up as much as 35 percent by volume of the soils throughout the entire analysis area. Soils throughout the area are generally quite stable, although some areas of slight rilling were noted in areas with

higher sand and fine gravel content. The bedrock character of the project area, composed of laminated siltite, argillite, and cross-bedded quartzite, dictates a low natural sediment rate for the area and good mass stability.

Hydrology: The analysis area is drained primarily by the Woodtick Creek and Moyer Creek drainages, both of which are tributaries of Panther Creek. Woodtick Creek, Moyer Creek, and a small portion of Panther Creek occur on the perimeter of the analysis area; smaller streams that occur within the analysis area are tributaries to these creeks. Salt Creek and "Perm" Creek are small perennial streams that are tributaries of Moyer Creek. Goodluck Creek and an unnamed creek to the west of Goodluck Creek are tributaries to Woodtick Creek.

Based upon past watershed inventories the stream channel stability in Moyer Creek and Woodtick Creek drainages is generally fair to good. Water quality data collected on Moyer Creek and Woodtick Creek in 1992 showed that existing beneficial water uses are currently being protected. Panther Creek and its tributaries above Blackbird Creek, including the streams in the analysis area, have been designated by the State of Idaho as having the following Designated Water Uses: Domestic Water Supply, Agricultural Water Supply, Cold Water Biota, Salmonid Spawning, Primary Contact Recreation, and Secondary Contact Recreation. Currently none of the streams within the analysis area are used as a source of domestic water. The primary existing beneficial water uses are for cold water biota, salmonid spawning, and secondary contact recreation.

Little Woodtick Creek, a small, intermittent stream that is a tributary of Woodtick Creek, is located north of and adjacent to the analysis area for the proposed timber sale. The 1988 Tick Creek Timber Sale in the vicinity of Little Woodtick Creek harvested about 23 percent of that drainage. As a result of harvesting a significant portion of the drainage, stream sedimentation has occurred in Little Woodtick Creek in the low-gradient depositional areas of the channel. However, Woodtick Creek, because of its greater flow, is able to transport the sediment delivered by Little Woodtick. No significant stream sedimentation is anticipated in Woodtick Creek as a result of the channel erosion in Little Woodtick Creek.

Several types of wetlands are found in the analysis area. Riparian stringer wetlands occur adjacent to streams, primarily Woodtick Creek, and are the most common. Isolated wetlands derived from springs and seeps and wet meadows with willows, alder, or other characteristic wetland vegetative communities are found scattered throughout the area.

Fisheries: The Woodtick Creek and Moyer Creek watersheds contain streams that are perennial and possess sufficient flow volume and aquatic habitat capability to support substantial fisheries resources. The mainstem reaches of Woodtick Creek and Moyer Creek both support well-established populations of resident salmonids such as bull trout (Dolly Varden), and rainbow trout; mountain whitefish also occur in Moyer Creek. The Woodtick Creek and Moyer Creek drainages are components of the Panther Creek drainage system, which was historically a major producer of several species of anadromous fish, including spring/summer chinook salmon and summer steelhead. The Moyer Creek drainage has been identified as the most important chinook salmon spawning tributary of the Panther Creek drainage system. However, Panther Creek and its tributaries have not been used by these species since the 1960s because of chemical pollution of mid and lower Panther Creek by the Blackbird Mine. With correction of the pollution problem and reintroduction, Moyer Creek could be a viable producer of anadromous fish.

Fish habitat capabilities in Woodtick and Moyer Creeks are moderate to high. These streams exhibit a diverse variety of microhabitats. Abundant adult rearing habitat is provided by lateral scour pools and dammed pools, and numerous shallow edgewater areas and backwater pools contribute to provide dispersed rearing habitat for juvenile life stages. Stream substrates in this area are dominated by angular quartzite rubble with clean gravels that are relatively free of fine-grained sediment. However, an existing 60-inch culvert where F.S. Road #107 crosses Woodtick Creek in the lower portion of the analysis area (Township 20 N, Range 19 E, Section 32) currently poses a barrier to upstream anadromous and resident fish passage on that stream.

Within the analysis area, streams that are tributaries to Woodtick and Moyer Creeks are generally small perennial streams whose fisheries habitat are largely limited to their lower reaches. These streams contain low gradient gravel-bottomed riffles and small pools that provide supplemental spawning and nursery habitat to mainstem Moyer Creek and Woodtick Creek fish populations. Although these streams provide relatively minor amounts of supplemental habitat to the Moyer Creek and Woodtick Creek systems, they serve important contributory functions to the maintenance of water quality within the larger streams.

Biological Diversity: Diversity in the Moyer Salt timber sale area was analyzed from three perspectives: regional, forest-wide and in the defined landscape.

Regionally (north central part of the intermountain west), many animals and plants communities found on the Salmon National Forest are similar to those in the rest of the region. Differences appear in the proportions of various plant communities (e.g. more logdepole pine than Douglas-fir in one area) due to varying aspects, elevations and latitudes.

Forest-wide, the conifer plant communities dominate (77% of non-wilderness areas) and a range of structural sized trees (e.g. seedlings, saplings, poles, immature and mature) are present. There are 36 regionally or nationally "listed" [Threatened, Endangered, Proposed and Sensitive (TEPS)] rare animal and plant species which occur or are suspected to occur on the Forest.

In the Moyer Salt Landscape (see Figure III-2) non-forested grass/shrub communities occur at lower elevations and conifers (lodgepole pine, Douglas-fir, subalpine fir) at the higher. Each community has it's own associated wildlife and plant species which are common to landscapes elsewhere in the region. There are 12 TEPS species known or suspected to occur in this landscape. Of those listed, only goshawk, lynx and bull/cutthroat trout have been observed. Wolves and chinook salmon were once residents. Their absence however, is unrelated to past or proposed timber management in the area.

Vegetation: The vegetation and therefore the wildlife habitat in the analysis area varies with elevation and aspect. The upper elevations are heavily forested and contain very few openings. Most of this forested area is comprised of a "mixed conifer" forest community that occurs on the subalpine fir habitat series. These forests contain a canopy of mature to overmature lodgepole pine with varying percentages of subalpine fir, Englemann spruce and Douglas-fir in the canopy and subcanopy. The lodgepole pine trees are dying of old age and insect and disease infestations, and are being replaced by subalpine fir trees. New trees are growing in the openings created when the older trees die. There is an abundance of dead trees and logs laying on the ground; this condition creates a very high risk of an intense wildfire occurring in the area. These stands have a high level of species, structural, and age diversity at the stand level. However, because this forest community occurs as one large homogeneous block with very few openings or variations in forest types, the diversity on the scale of the analysis area is low.

Another component of the lodgepole pine community is a stand condition that is characterized by an abundance of closely spaced pole-sized trees that have stopped growing or are dying due to competition between individual trees and infestation by insects and dwarf mistletoe, a parasitic plant. As these trees die they are being replaced by subalpine fir trees. Because these stands are comprised of trees that are all the same age and size, they have very low diversity on both the stand level and the analysis area level.

A Douglas-fir forest community that occupies several Douglas-fir habitat types is present at lower elevations than the lodgepole pine forests. At the highest elevations the Douglas-fir forests are characterized by heavily forested slopes that occur on all aspects. At lower elevations the forested areas are confined to the north-facing slopes, creating forested stringers separated by sagebrush openings. These stands occur on a variety of habitat types and thus contain a diversity of plant species. These ecotones are important wildlife habitat components, particularly for species that require forest/nonforest environments.

The Douglas-fir community can be broken down into two stand conditions: one is composed entirely of stands of older Douglas-fir trees with very few young trees; these stands have very low species, structural or age diversity on the stand scale. The remainder of the Douglas-fir community is a mix of overmature Douglas-fir and lodgepole pine canopy with minor Englemann spruce and subalpine fir with a variable understory of lodgepole pine and Douglas-fir. These stands contain varying amounts of new young trees. Structural, species, and age diversity of these stands is high on the stand level.

The distribution of forest communities in the analysis area is a function in part of the fire history of the area. Many of the lodgepole pine stands were established following large forest fires in the 80-120 years ago; therefore, many of the trees in the area are the same age. Since the arrival of European man in eastern Idaho the natural fire regime has been interrupted, and forest that normally would have burned and generated new stands of young trees have not done so. Therefore, the age diversity and the diversity of condition classes within the analysis area is low; most of the stands in the area are in the mature to overmature condition classes (lodgepole pine trees are 80 to 160 years old, and Douglas-fir trees are 120 to 210 years in age), and 95 percent of the stands occur within two age classes. The lack of age diversity and the advanced age of these stands increase the susceptibility of these stands to catastrophic events such as attack by insects or disease.

Timber Resources: The timber resources in the area have been affected by past timber harvest activities, fire and fire suppression, and climatic events such as drought that affect the condition of the stands at present. A variety of forest insects and diseases are known to exist in the analysis area, including western spruce budworm, lodgepole pine dwarf mistletoe, mountain pine beetle, Douglas-fir beetle, and western balsam bark beetle. Some of these insects and diseases are causing defoliation, reduced growth, or mortality in the tree stands, whereas others are present at levels that are not significantly affecting the growth and vigor of the forest.

Previous timber harvest activity that has occurred within the Moyer Salt Timber Sale analysis area includes 500 acres of harvest in the Douglas-fir community in the 1973-74 Salt Creek Timber Sale in the northwestern portion of the analysis area, and 128 acres of the lodgepole pine community was clearcut in the 1989 Tick Creek Timber Sale.

During the planning process for the Forest Plan the suitability of all lands on the Forest for timber harvest was determined. Within the 15,360-acre analysis area, 11,292 acres are in the suitable timber base. The site potential of these lands (or estimated yield capabilities, in cubic feet of wood fiber per acre per year) averages 40-50 cubic feet/acre/year, but most stands are old and no longer growing at a productive rate, and thus are producing much less than this amount. The age class distribution of timber stands in the analysis area shows that currently less than 5% of the forested areas in the analysis area are in age class 1 or 2. The remaining 95% of the stands in the analysis area are in age classes 4 and 5 (for Douglas-fir) and in 3 and 4 (for lodgepole pine). Lodgepole pine stands may be as old as 120 years while Douglas-fir stands may exceed 200 years old.

Wildlife Resources: The "management indicator species" (MIS) approach was used in the Salmon National Forest Plan's process to help assess and predict the influence of forest management practices on habitat, species diversity and individual species well-being. MIS species include big game species, threatened and endangered species, and other species for which population levels and habitat objectives can be established and which represent a number of other wildlife species. MIS species from the Forest Plan's list that occur in the analysis area include: elk, mule deer, mountain goat, bighorn sheep, pine marten, pileated woodpecker, vesper sparrow, yellow warbler, ruby-crowned kinglet, goshawk, yellow-bellied sapsucker (now called red-naped sapsucker), brown creeper and mountain bluebird.

Elk, mule deer and mountain goats are the big game species that occur in the analysis area; elk and mule deer are most abundant and occur throughout the entire area. The forested/nonforested ecotones and aspen

clones, particularly on the Moyer Creek face and in Salt Creek, are used as calving, fawning and nursery areas by elk and mule deer. Approximately half of the analysis area has been mapped as key elk summer range (KESR), but the entire area receives heavy spring, summer and fall elk and mule deer use. Habitat for big game varies throughout the analysis area depending on the vegetation types present.

The forested lands below approximately 7500 feet elevation (Area I) consist primarily of Douglas-fir timber stands and minor mixed conifer (Douglas-fir, subalpine fir, Englemann spruce, and lodgepole pine) timber stands. Natural timber/nontimber ecotones, openings dominated by sagebrush and bunch grasses, and small aspen stands or clones occur throughout this area in conjunction with blocks, stringers and islands of timber and give the area very high habitat potentials for mule deer and elk. Most of the timber stands, particularly the Douglas-fir stands, are in an old growth condition (most trees are more than 200 years old, a mix of age classes is present, and the stand is in a natural mature to overmature state). Habitat for old-growth dependent species such as goshawk and pine marten is available in pristine condition.

Area II, the upper elevations generally surrounding Moyer Peak, is dominated by fairly uniform stands of mixed conifers, including lodgepole pine and subalpine fir with some Englemann spruce in the more mesic sites. This area is almost entirely within the subalpine fir/grouse whortleberry habitat type. Very few natural openings exist and habitat diversity is low. Timber stands in old-growth condition are abundant. This area offers extremely good big game hiding and/or security cover.

Other wildlife species that occur in the analysis area are typical for this portion of Idaho and include black bear, cougar, bobcats, coyotes, pine marten and beaver. Game birds such as blue, ruffed and Franklin's (spruce) grouse occur throughout the area. Cavity nesting and/or old growth dependent MIS, including goshawks, pine marten, great gray owls, pileated woodpeckers and brown creeper, are found throughout the analysis area. Populations of these species are high due primarily to the relatively pristine old-growth habitat component.

Threatened, Endangered and Sensitive Species: Columbia River spring/summer chinook salmon have recently been listed as 'Threatened' status by the National Marine Fisheries Service (Federal Register, April 22, 1992). This species has historically utilized mainstem Moyer Creek spawning and rearing habitats (Reiser, 1986), but are currently unable to access these habitats due to mainstem Panther Creek water quality problems due to acid mine drainage.

Potential habitat for the Endangered gray wolf exists in the area, although no wolves are known or suspected to occupy the area at this time. The entire area is included within the Central Idaho Wolf Recovery Area and may become important to this species at some point in the recovery process.

Ten species from the Forest Service Intermountain Region Vertebrate Sensitive Species List were assessed to determine whether they are present or their habitat is present in the analysis area. Although habitat for each of these species (North American lynx, wolverine, western or Townsend's big-eared bat, boreal owl, northern three-toed woodpecker, great gray owl, spotted frog, northern goshawk, bull trout and steelhead) occurs in the analysis area, only the Northern goshawk has actually been observed in the area. Habitat for the Northern goshawk is present throughout the area in dense, old-growth conifer, mixed conifer/aspen, and aspen stands. One nest site is known to occur in the area, and others may be present but have not been sighted. Bull trout (Dolly Varden) are known to be present in the mainstem reaches of both Woodtick Creek and Moyer. Habitat for steelhead trout exists in Moyer Creek and Woodtick Creek but is not currently utilized because of downstream water pollution of Panther Creek due to acid mine drainage.

Roadless Area Resource: The 63,220-acre Taylor Mountain Roadless Area is the only inventoried roadless area that would be affected by the alternatives for this proposed action. Approximately 40 percent of the acres within the roadless area boundary are in management areas that include timber management objectives. The

remaining 60 percent of the area has management prescriptions for semi-primitive motorized recreation opportunities. Only the northern portion of the roadless area would be affected by the proposed action.

The Taylor Mountain Roadless Area appears undeveloped to most visitors. Effects of human activities are limited to the fringes of the Roadless Area where Forest roads, jeep trails and foot trails are located. There are many opportunities for primitive recreation within the boundaries of the roadless area, including hunting, hiking and horseback riding. Approximately 80 percent of current primitive recreation consists of elk hunting. Motorized recreation is allowed under current management direction, and most is centered along the Moyer jeep trail.

The Taylor Mountain Roadless Area is not considered outstanding for solitude opportunities because of its relatively small size and noticeable human activities along the perimeter. The difficulty of travel in the area does promote a sense of remoteness. The apparent natural naturalness and natural integrity of the area is compromised by evidence of human disturbance and the sounds of heavy equipment and vehicles in areas north of the analysis area.

Visual Resources: Views into the area from designated sensitive travel routes (Panther Creek Road (F.S. Road 055) (Sensitivity level 1), Moyer Creek Road (F.S. Road 103) (Sensitivity level 2), and the Salmon River Mountain Road ("Ridge Road") (F.S. Road 020) (Sensitivity level 2)) are limited and are generally of the rounded, forested ridge tops. Visual Quality Objectives of the area are Partial Retention and Modification.

Recreation Resources: Current recreation use is considered light and is primarily related to big game hunting in the fall. There are no system trails in the area. The Moyer Jeep Trail, located along the south edge of the proposal area, is probably the heaviest used portion of the area. Current Recreation Opportunity Classes include Roaded-Natural Appearing, Semi-primitive Motorized and Semi-primitive Nonmotorized.

Air Quality: All Salmon National Forest lands, including wilderness areas and the proposed timber sale area, are in a Class II airshed as designated by the 1977 Clean Air Act. The Class II designation allows moderate increases in new air pollution. Air quality in the analysis area is generally excellent and meets guidelines established by Idaho air quality laws and the National Clean Air Act. Air quality may be degraded as a result of prescribed burning in the spring and fall by the Salmon National Forest and surrounding forests, fire management fires burning in areas north of the Salmon National Forest, dust from roads, logging operations, and mining operations, and wildfires.

Range Resources: Two range allotments, the Williams-Napias Creek C&H allotment, on the north end of the analysis area, and the Forney C&H allotment to the south, occur in the analysis area. Both are cattle allotments and are good condition.

Transportation and Access: Existing roads located on the perimeter of the analysis area are mostly used for recreation and consist of 12 miles of maintained road and 5 miles of primitive jeep trail (F.S. Trail 6204, the Moyer Peak jeep trail). These roads are open year-round and all except the primitive jeep trail are maintained for recreation traffic. Existing timber access roads within the analysis area include 12 miles of timber access road and approximately 2 miles of old logging roads that are gated and closed to the public for big game security and erosion control.

Mineral Resources: The potential for minerals development in the analysis area for leasable minerals (oil, gas and coal) and locatable or hard rock minerals was assessed. Although there are presently active mining claims in the analysis area, no known mineral occurrences exist and no mineral production has occurred. The potential for a locatable mineral discovery exists but no deposits occur in the area. The geology of the area also suggests a low potential for oil, gas or coal development.

Cultural Resources: The Moyer Salt timber sale analysis area was partially inventoried for cultural resources, and no cultural resources were found. A cultural resources survey will be performed for unsurveyed areas before project implementation. The analysis area appears to have a relatively low probability for significant cultural resource properties.

Economic Efficiency: The issues of "below-cost" timber sales and of the economic stability of communities in the Forest's primary zone of influence were raised by the public during development of the Salmon Forest Plan (see the Record of Decision for the Forest Plan). The issue of below-cost sales is based on the General Accounting Office cash-flow accounting that compares single-year dollar receipts with costs occurring in the same year. This accounting method does not consider long-term investments in roads and other facilities or benefits to resources that cannot have a dollar value placed on them. When viewed strictly from the viewpoint of the GAO accounting method, the Forest Service sometimes offers timber sales that don't return the cost of selling and administering them. Not only could other forest resources benefit as a result of these timber sales, but this will also provide an opportunity to assist in maintaining a viable lumber manufacturing base and economic stability to the local dependent community.

Concern has been raised that the proposed sale is not economically efficient and would not result in long-term positive cash flow. The economic efficiency of the proposed alternatives was evaluated using the present net value (PNV) of the alternatives calculated from the MBF sold, post sale costs, road costs, bridge costs, cattleguard costs, and other costs associated with the sale.

COMPARISON OF ALTERNATIVES

Table I contains a summary of the effects of the alternatives on the resources in the analysis area. The measurement indices used to compare these effects are those identified in the discussion of the issues.

TABLE I: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
VEGETATION							
Vegetative Diversity:							
Acres Harvested	0	568	440	847	292	747	502
Age distribution following harvest (in percent of analysis area)							
(0-39 yrs)	4.9	9.3	8.3	11.5	7.2	10.7	8.8
(40-79 yrs)	0	0	0	0	0	0	0
(80-119 yrs	11.7	11.7	11.7	11.7	11.7	11.7	11.7
(120-159 yrs)	69.9	66.1	67.1	64.3	68.3	64.9	66.6
(165+ yrs)	13.5	12.9	12.8	12.7	12.8	12.7	12.9
Change in species diversity in harvest units	None	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase
Timber Resource:							
Volume production in mmbf	0	4.9	3.75	6.9	1.79	6.1	4.2
mmbf deferred *	-6.1	-1.2	-2.25	0.8	-4.31	0 **	-1.1
Risk of infestation by insects and diseases	Moderate to High Increase	Strong Decrease	Moderate Decrease	Strong Decrease	Low Decrease	Strong Decrease	Low Decrease
Risk of infestation by noxious weeds	Very Low	Low	Low	Moderate	Very Low	Moderate	Low
Harvest Method:							
Clearcuts with Islands	0	0	0	0	0	427	402
Clearcut Acres	0	410	270	645	124	186	10
Shelterwood Acres	0	158	170	202	168	202	158

* The amounts given here represent the difference between the largest Forest Plan consistent mmbf alternative offered (Alternative 6) and the other alternatives. These volumes display the mmbf that would be deferred from this offer during this planning period.

** Alternative 6 represents the largest mmbf sale quantity off that meets the Forest Plan Standards and Guidelines for all resources.

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
WILDLIFE							
Elk and Deer:							
* Elk Habitat Potential (EHP) (Percent of potential)							
Area I	67%	51%	51%	48%	59%	51%	53%
Area II	87%	90%	88%	92%	88%	90%	89%
Open Road Density: (Miles road per square mile)							
Area I	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Area II	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Total Road Density: (Miles road per square mile)							
Area I	0.14	1.46	2.25	1.0	0.14	1.0	1.28
Area II	0.56	2.5	1.5	2.9	0.72	2.7	2.42
Cover to Forage Ratio:							
Area I	32:68	27:73	27:73	26:74	29.71	27.73	28.72
Area II	80:20	72:28	75:25	68:32	77.23	69.31	73.27
** Elk Habitat Security:							
Area I	High	Low	Moderate	Very Low	Moderate	Low	Low
Area II	Very High	High	High	High	Very High	High	High
*** Elk Vulnerability:							
Area I	Moderate	Very High	High	Very High	High	Very High	Very High
Area II	Very Low	Moderate	Low	Moderate	Low	Moderate	Moderate
**** Old-growth Dependent Species:							
Acres of Timber Stands with Old Growth Characteristics Remaining:							
Area I	1750	1500	1520	1430	1625	1475	1540
Area II	3550	3200	3250	3025	3310	3040	3250
Percent Loss of Timber Stands with Old Growth Characteristics:							
Area I	0%	15%	13%	18%	7%	16%	12%
Area II	0%	10%	8%	15%	5%	14%	8%
Acres of Forest Plan Designated Old-Growth Retention Stands Cut:							
Area I	0	0	0	0	0	0	0
Area II	0	0	0	0	0	0	0

* Elk Habitat Potential (EHP) is the indicator for effects to elk and deer and is derived from the cover to forage ratio and the miles of road per square mile.

** Elk Habitat Security is 30% of an area occupied by cover blocks of 250 acres located 1/2 mile from open roads.

*** Elk Vulnerability reflects ease of human access and susceptibility of hunted elk.

**** The acres and percent loss of timber stands with old growth characteristics and old-growth retention stands are the indicators for effects to goshawk, pine marten and other old-growth dependent species.

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
ROADLESS AREA:							
Acres of Roadless Area Affected	0	9920	9920	9920	208	9920	9920
Percent of Taylor Mtn. Roadless Area Affected	0	16%	16%	16%	<1%	16%	16%
Acres of Roadless Area Remaining	63,220	53,300	53,300	53,300	63,012	53,300	53,300
Wilderness Eligibility Of Roadless Area Maintained	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effects to Roadless Characteristics:							
Natural Integrity	None	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease
Apparent Naturalness	None	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease
Primitive Recreation	None	None	None	None	None	None	None
Solitude	None	Decrease	Decrease	Decrease	None	Decrease	Decrease
Special Features	None	None	None	None	None	None	None
Special Places and Activities	None	None	None	None	None	None	None
ECONOMIC EFFICIENCY							
Present Net Value							
Long Term Average	0	-$210,077	-$161,329	-$300,679	*	-$277,853	-$180,069
Present Trend	0	+$253,925	+$303,502	+$295,651	-$94,938	+$303,626	+$262,241
Gross Stumpage Income							
Long Term Average	0	+$400,670	+$306,186	+$564,444	+$69,315	+$498,801	+$343,235
Present Trend	0	+$569,100	+$525,300	+754,200		+$706,200	+$527,100
Road Costs							
Construction	0	+$372,150	+$383,850	+$411,150	+$42,000	+$411,150	+372,150
Road Costs/mbf	0	+76	+$102	+$60	+$26	+$67	+$89

The economic efficiency of the alternatives can be compared by calculating the present net value and gross income of each alternative. These were calculated based on the long term average prices and with present prices to reflect the recent increases in the value of timber.

* No value was calculated because this alternative was not economically viable (it would not sell) with the long term stumpage values.

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
SOILS							
Existing Roads	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.
New Roads	0 0	16.8 mi. 62.1 ac.	14.6 mi. 55.2 ac.	17.8 mi. 66.1 ac.	1.1 mi. 4.0 ac.	17.8 mi. 66.1 ac.	16.8 mi. 62.1 ac.
Acres of Total Soil Resource Commitment	57 ac.	119 ac.	111 ac.	123 ac.	61 ac.	123 ac.	119 ac.
Percent of Analysis Area with Total Soil Resource Commitment *	0.4%	0.8%	0.7%	0.8%	0.4%	0.8%	0.8%
HYDROLOGY							
Effects to Water Yield:							
Percent of Drainages Harvested*:							
Woodtick Creek	5.2%	7.3%	7.0%	8.2%	6.0%	7.9%	7.1%
Salt Creek	0%	9.1%	4.5%	14.3%	5.1%	12.3%	8.2%
"Perm" Creek	0%	11.3%	11.3%	14.2%	4.3%	13.1%	10.4%
Predicted Changes to Water Yield	None	No Major Effect	No Major Effect	No Major Effect	Minimal	No Major Effect	No Major Effect
Beneficial Water Uses Maintained	Yes	Yes	** No	Yes	Yes	Yes	Yes
State Water Quality Standards Met	Yes	Yes	** No	Yes	Yes	Yes	Yes
WETLANDS							
Acres of Wetlands Affected	None	* <3	* <2	* <3	None	* <3	* <3

* Total soil resource commitment occurs when the soil is committed to a use other than growing vegetation for an extended period of time; this typically occurs in roads, landing areas, and some skid trails.

* Research has shown that harvesting more than 20 percent of a drainage can result in detectable increases in peak flow due to loss of vegetation.
** Beneficial water uses would be maintained and state water quality standards would be met in Woodtick Creek and Moyer Creek. Adverse water quality impacts are anticipated in Salt Creek only.

* These acres of affected wetlands are primarily at stream crossings.

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
FISHERIES							
Anadromous and Resident Fish Habitat Maintained	* Yes	Yes	** No	Yes	Yes	Yes	Yes
BIOLOGICAL DIVERSITY - See TES and Wildlife Sections							
THREATENED, ENDANGERED AND SENSITIVE FISH SPECIES (The final biological assessment of effects to T & E fish species is being documented within the Salmon National Forest's Proposed Activity Review for the Panther Creek Watershed. Concurrence from the National Marine Fisheries Service is unknown at this time).							
Effects to Listed Fish T & E Species and Their Habitat	No Effect	Not LTAA*	LTAA*	Not LTAA*	Not LTAA*	Not LTAA*	Not LTAA*
Effects to Potential Fish T & E Habitat	No Change from Existing Condition	Improvement in Woodtick Creek	Improvement in Woodtick Creek Degradation in Salt and Moyer Creeks	Improvement in Woodtick Creek	Improvement in Woodtick Crseek	Improvement in Woodtick Creek	Improvement in Woodtick Creek
Effects to Region 4 Sensitive Fish Species and Their Habitat	No Effect	*Not LTAA	*LTAA Steelhead and Bull Trout	*Not LTAA	*NOT LTAA	*Not LTAA	*Not LTAA
THREATENED, ENDANGERED AND SENSITIVE VERTEBRATE SPECIES							
Effects to Gray Wolf						Not LTAA	

* Anadromous and resident fish habitat would not be maintained in the Salt Creek drainage, and habitat within the mainstem Moyer Creek streamcourse below the mouth of Salt Creek would additionally be at high risk of being adversely impacted. Habitat would be maintained within the Woodtick Creek, Goodluck Creek, and "Perm" Creek drainages under this alternative, however.

* LTAA - Likely to Adversely Affect

* LTAA - Likely to Adversely Affect

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
VISUAL RESOURCES							
Number of Units Where Visual Quality Objectives Are Not Met	0	0	0	5	0	0	0
RECREATION							
Acres Converted from Semi-Primitive Motorized & Nonmotorized to Roaded Natural Appearing	0	6,990	6,310	6,990	0	6,990	6,990
AIR QUALITY							
State and National Air Quality Standards Met	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TRANSPORTATION AND ACCESS							
Acres available for timber harvesting with existing road system	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Acres available for timber harvesting with proposed road system	0	2,807	1,824	2,957	150	2,957	2,807
Miles of Road Constructed	0	16.8	14.6	17.8	1.1	17.8	16.8
MINERALS							
Would interfere with potential mineral development	No	No	No	No	No	No	No

TABLE I, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
CULTURAL RESOURCES							
* Potential Impacts to Cultural Resources	None	Low	Low	Low	Low	Low	Low

* A cultural resources survey will be completed before any ground disturbing activities begin. Approximately 95% of the area was cleared by SHPO on 8/18/92. Clearance is expected by 8/1/93 on the remaining 5% of the area.

RANGE RESOURCES							
Change in Range Resource	None	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement

Chapter I

Purpose and Need

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CHAPTER I

PURPOSE OF AND NEED FOR ACTION

CHANGES BETWEEN THE DRAFT AND FINAL

The US Fish and Wildlife Service have added the Endangered gray wolf to their species list. A Biological Assessment was prepared to assess the effects of this timber sale on the gray wolf.

PROPOSED ACTION

The Forest Service proposes to harvest timber, construct and reconstruct roads, and regenerate new stands of trees in portions of the Moyer Creek, Salt Creek, Woodtick Creek, and Goodluck Creek drainages, and Pete's Gulch in the Cobalt Ranger District of the Salmon National Forest (Figure I-1, Vicinity Map). The proposed Moyer Salt Timber Sale (formerly the Moyer Salt and Salt Creek Timber Sales) was originally disclosed in the Notice of Intent in the July 6, 1990, *Federal Register*, and is included as Alternative 2 in Chapter II. The proposed timber harvesting and road construction activities would harvest about 568 acres in a maximum of 32 units and construct about 16.8 miles of road. Trees harvested from these units would yield approximately 4.9 million board feet (mmbf) of timber. The Moyer Salt and Salt Creek Timber Sale would be offered for sale in 1993; the timing of timber harvesting would be staggered between two wildlife subdivisions.

PURPOSE OF AND NEED FOR ACTION

The action alternatives outlined in this proposal are designed to implement the silvicultural objectives and goals of the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan). The ultimate goal of these objectives is to meet the desired future condition (DFC) of the Forest as established in the Forest Plan (Forest Plan, IV 89-90). The standards and guidelines that dictate how these silvicultural management activities are implemented would be followed. More specifically the proposal has the following purposes:

The proposed action alternatives are designed to help provide a continuous flow of raw materials to dependent manufacturing communities and thereby provide community stability. It is also designed to enable the public to gather firewood. The proposed action is consistent with maintaining the customs and cultures of these communities.

The economies in Lemhi and Custer Counties in Idaho and Ravalli County, Montana, are dependent in part on Forest resources for grass, timber and water (Lemhi County Report, 1990). This demand from the Salmon National Forest and parts of the Cobalt Ranger District has been strong and is expected to increase.

The Forest Plan designated areas that are suitable for timber production, and has identified an annual allowable sale quantity (ASQ) from this land base of approximately 21 million board feet (mmbf) of timber. One purpose of this proposed timber sale action is to contribute, in part, to the Forest Plan objective of partially satisfying the commercial demand for timber (Forest Plan, 1988, III-4). This objective will provide for community stability in the Forest's area of influence and is consistent with the customs and culture of these communities.

If the Selected Alternative provides less timber volume than the alternative that meets the maximum Forest Plan Volume (Alternative 6 - the Preferred Alternative), the reasons for providing the lesser volume will be addressed in the Record of Decision and the shortfall will not be offered during this planning period. (See Table II-2, Timber Resource).

The proposed action alternatives are designed to improve the growth and vigor of the Forest through silvicultural treatments that would produce a more vigorous distribution of size and age classes of timber stands as well as increase the vegetative and structural diversity of the Forest.

The desired future condition of areas available for timber management as established by the Forest Plan shall contain a specific distribution of timber stand ages in the year 2030 (Forest Plan, IV-90, and Chapter III: Vegetation, this document). This age distribution would provide a distribution of size and age of timber that would maintain a continuous supply of timber in the future, provide future Forest managers with a wide array of harvest alternatives, create timber stands that are more resistant to insect and disease infestations than existing stands, and improve the overall health of the forest ecosystem.

Many of the trees in the project area are old; they are mature (e.g. they have attained full development and are capable of seed production) or overmature (they have passed maturity and are in a state of declining health and vigor). Many of the timber stands are made up of trees that are alive but not growing due to insect and disease activity and physical breakdown. In some stands, growth has stopped, is progressing at an extremely slow rate, or is negative (loss of wood to mortality is greater than wood gain through growth). To improve the health and productivity of the forest it is necessary to 1) diversify the stands of overmature and mature trees and create a wider range of ages; and 2) enhance the forest's vegetative and structural diversity. As a result of the high mortality rate in these stands, an abundance of highly combustible dead material is lying on the ground in many of these stands, creating a fire hazard. Timber harvest in these stands would reduce and redistribute this material and would decrease the risk of large wildfires.

Timber harvesting and timber stand improvement (TSI) activities are an integral part of silvicultural management of the timber resource for long-term needs. These activities are conducted to increase the growth rate and productivity of the stands, improve the quality of the stands, maintain desirable species composition, manage insect and disease activity, improve aesthetics, and generally maintain productive stand conditions. TSI activities consist primarily of thinning of overstocked stands (stands that have more trees growing on them than is desirable for vigorous growth) and release cutting (removing competing trees that inhibit or prevent growth in younger trees).

The proposed action alternatives are designed to improve the health of the Forest by applying coordinated Forest insect and disease management strategies and techniques that would reduce damage and loss due to insects and diseases.

Loss of timber due to insects and disease is contrary to the management direction established in the Forest Plan. Insect and disease management direction is to prevent or suppress insect and disease populations that threaten Forest tree stands using an Integrated Pest Management (IPM) approach consistent with resource management objectives (Forest Plan, IV-71-75).

Within the analysis area established for the proposed action, Douglas-fir stands are showing the effects of defoliation by western spruce budworm, and Douglas-fir beetle attacks have been numerous due to stress conditions created by prolonged drought. Many lodgepole pine stands are infected with dwarf mistletoe and some are infected by mountain pine beetles. Subalpine fir trees are locally infested with western balsam bark beetle. Forest Plan direction emphasizes harvesting susceptible and infected stands (Forest Plan, IV-90), with priority given to overmature or deteriorating stands (Forest Plan, IV-73-75). This allows harvesting of infected or susceptible stands while the timber has marketable value. Enhancement of species diversity of the existing stands and the stands of trees that regenerate the site, and selection of less susceptible species in the regenerated stands would also reduce loss to insects and diseases.

Further discussion of the Forest Plan and its silvicultural goals and objectives is found in the Record of Decision for the Salmon Forest Plan, April 1988 (page 12); the Final Environmental Impact Statement for the Salmon National Forest Land and Resource Management Plan (Chapter IV, page 33); and the Salmon Forest Plan (Chapter IV, pages 1 to 4, 17, 89).

VICINITY MAP

Salmon National Forest

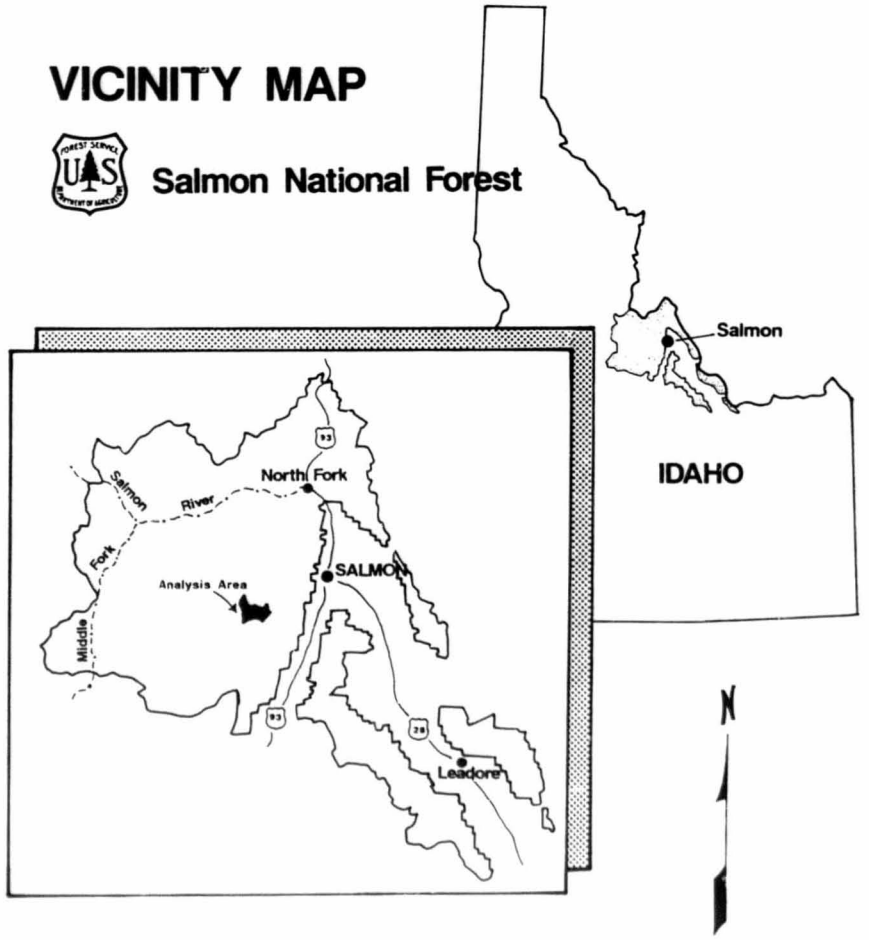


FIGURE I-1
VICINITY MAP

LOCATION AND ACCESS

The Moyer Salt Timber Sale is located approximately 22 air miles southwest of Salmon, Idaho (Figure I-2, Location Map). The analysis area for this timber sale (shown on Figure I-2) includes the proposed timber units and surrounding area where direct, indirect, and cumulative effects would occur if the proposed action is implemented and where the analysis of effects would be performed. In addition to the analysis area described above, the area of analysis for each resource may vary from that shown in Figure I-2, and is specified for each resource in Chapter III, Affected Environment.

Of the approximately 15,360 acres in this analysis area, an estimated 9,920 acres are located within the northern portion of the Taylor Mountain Roadless Area. This roadless area is listed as No.13902 on the Salmon National Forest and as No.06902 on the Challis National Forest. The area was formerly listed as RARE II No.4502.

The analysis area is accessed from the west by the Panther Creek Road (F.S. Road 055) and the Copper Creek-Swan Peak Road (F.S. Road 099). F.S. Road 107 intersects F.S. Road 099 in Section 28, T20N, R19E, and crosses Little Woodtick Creek and Woodtick Creek before entering the analysis area. This road was built as a timber access road for harvesting the 1989 Tick Creek timber sale. From the east the analysis area is accessed by the Salmon River Mountain Road ("Ridge Road") (F.S. Road 020) and the eastern portion of F.S. Road 099. Forest Service Road 106 (Swan Peak Road) intersects F.S. Road 099 in Section 2, T19N, R19E, and accesses the eastern part of the analysis area.

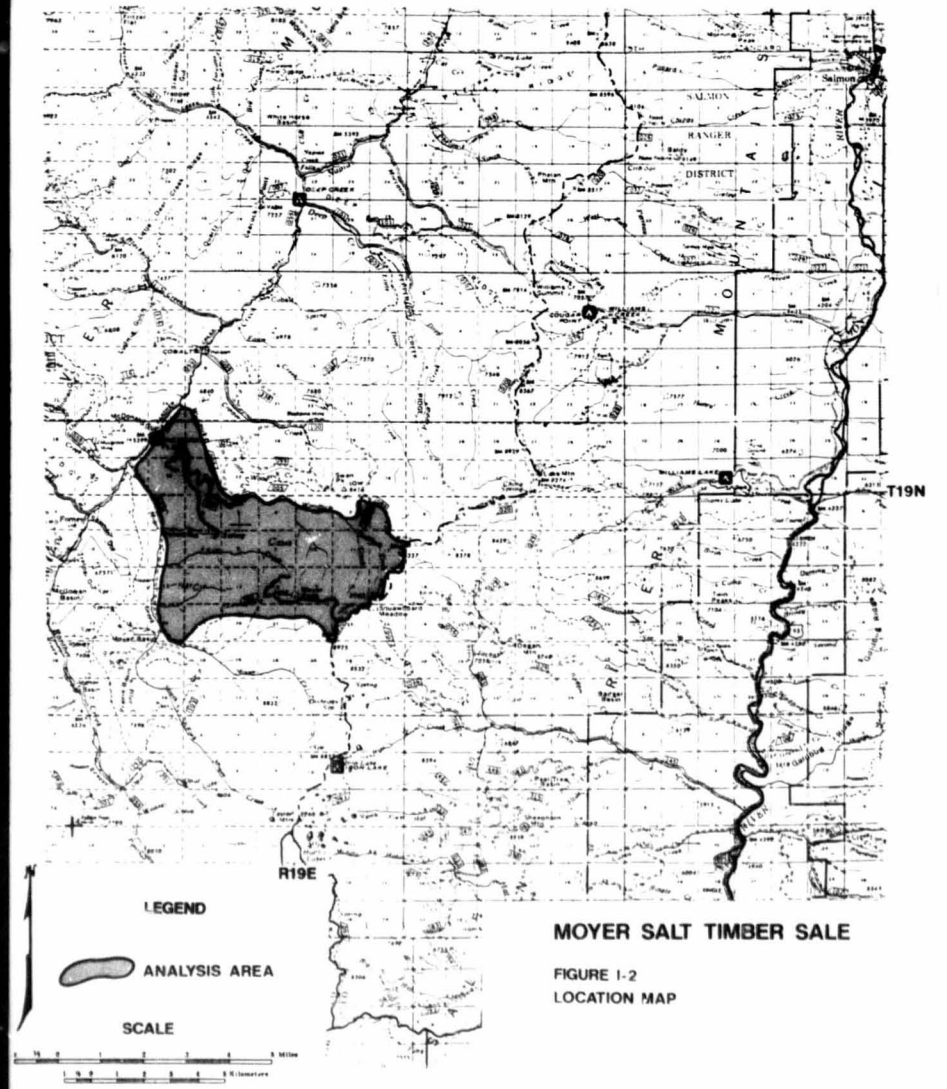
THE FOREST PLAN

Long-term management direction for the Forest was established in the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan), approved in January, 1988. In approving the Forest Plan, the Regional Forester established the following items:

* The Desired Future Condition (DFC) of the Forest for all resources and uses of the Forest;
* Forest Plan multiple use goals and objectives, and management standards and guidelines to achieve them;
* Monitoring and evaluation requirements to determine whether the goals and objectives are being met and standards and guidelines of the Forest Plan are being used;
* Management Areas, or sub-units of the Forest with similar management goals and a common management prescription;
* Lands suited for timber management and the maximum amount of timber that may be sold from those lands during the ten ye · planning period for the Forest Plan (Allowable Sale Quantity); and
* Lands recommended for wilderness classification and land use allocations for inventoried roadless areas not recommended for wilderness.

The proposed activities are designed to implement the Forest Plan. This Final Environmental Impact Statement (FEIS) contains a detailed, site-specific analysis which supplements the Forest Plan EIS and which focuses on the environmental effects and alternatives relating to the proposed action. This analysis is therefore tiered to the Forest Plan EIS and Record of Decision, which are incorporated by reference at the appropriate passages throughout this Final EIS. This document also discloses the analysis and implementation of management practices designed to achieve the goals and objectives of the Forest Plan.

For a more detailed discussion of the role of the Salmon National Forest in managing the Forest timber resources, refer to the following documentation: Record of Decision for the Salmon National Forest Land and Resource Management Plan, January 1988 (pages 13 to 15); Final EIS for the Salmon National Forest Land and Resource Management Plan (Chapter II page 137, Chapter IV pages 28 to 39); and the Salmon National Forest Land and Resource Management Plan (Chapter IV, pages 2,82,89,90). Other management direction is included in the Salmon National Forest Noxious Weed Control Program Environmental Assessment (EA)



MOYER SALT TIMBER SALE

FIGURE I-2
LOCATION MAP

and in other amendments to the Forest Plan referenced throughout this document.

Management Area Goals

The Salmon Forest Plan Management Area (MA) prescriptions in the Forest Plan (Chapter III, 93-160) identify the management activities that will occur on the area of land covered by that prescription. Although these are multi-functional management activities that are designed to achieve the goals and objectives established by the Forest Plan, each Management Area prescription places an emphasis on management of one or several Forest resources. The Moyer Salt Timber Sale analysis area contains MA prescriptions that have a dual emphasis on aquatic habitat management and timber management. These MAs are shown in Figure I-3 and described below:

Management Areas 3A-5A, 3A-5B, and 3A-5C

Management emphasis in areas with a 3A prescription is on anadromous fish species habitat needs. Habitat quality and quantity will be commensurate with meeting or exceeding Idaho Department of Fish and Game anadromous fish planning goals and requirements for listed and proposed threatened and endangered fish species established by the National Marine Fisheries Service. Timber harvest and management is compatible, but the activity, intensity and timing of timber harvesting will be appropriate to meeting habitat quality goals.

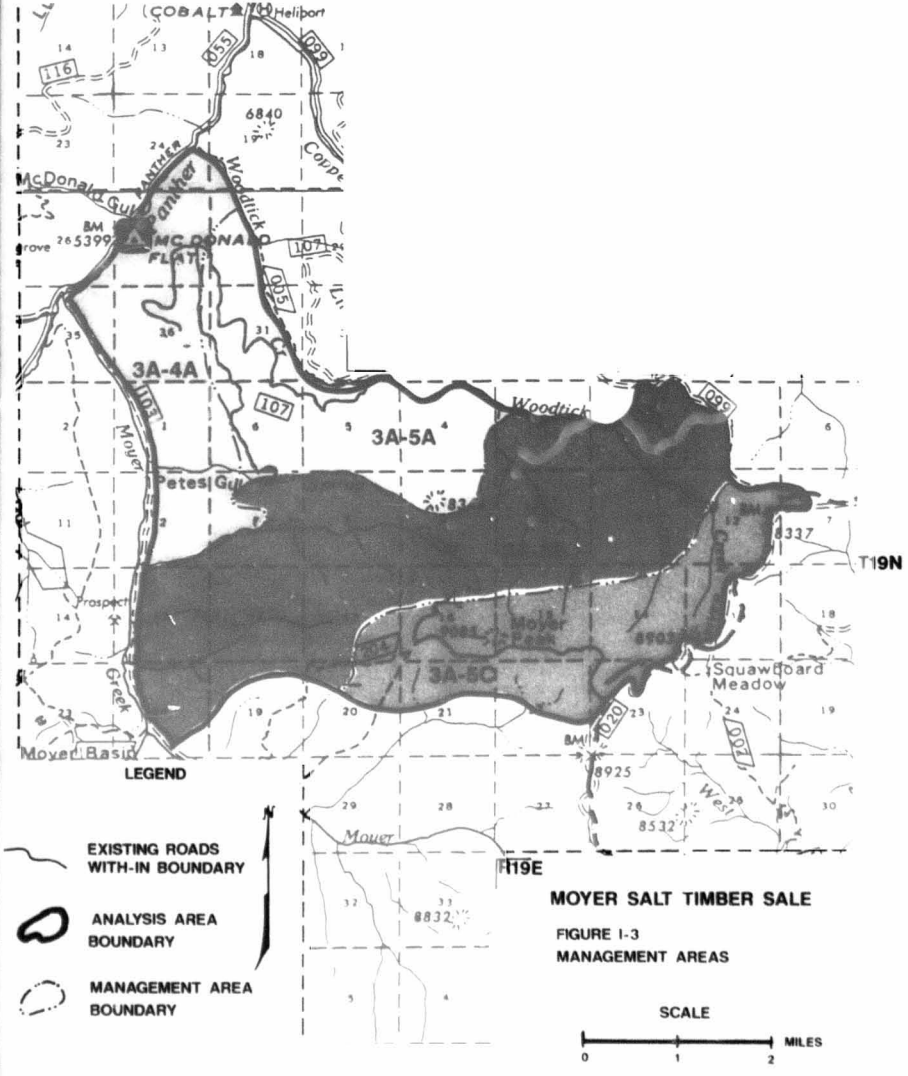
Management emphasis in areas with 5A, 5B, and 5C prescriptions is on a high (5A), moderate (5B), or low (5C) commercial sawtimber production and utilization while maintaining habitat for target or viable populations of all native vertebrate species of fish and wildlife.

Management Area 3A-4A

Emphasis for prescription 3A is on meeting anadromous fish habitat needs, as described above. Emphasis for prescription 4A is to provide for big game habitat needs such as forage and cover on key big game winter range. Treatments to increase forage production, alter plant species composition, or to create or maintain hiding and thermal cover for big game are applied. Vegetation manipulation is allowed for enhancement of habitat.

All of the timber harvesting activities in the action alternatives described in this document would be confined to the 3A-5A, 3A-5B, and 3A-5C management areas. A very short segment of the timber access road for the Salt Creek portion of the timber cutting units for Alternative 3 crosses the southeastern portion of the 3A-4A management area; all other roads are in 3A-5A, 3A-5B, and 3A-5C management areas. The 3A-4A management area is included in the analysis area because all of these activities could directly or indirectly affect the fish and big game habitat in the area and these potential effects must be analyzed.

The goal of vegetation management for lands within those MA's that are available and suitable for timber production is to provide vigorous and healthy stands which would: 1) have a broad representation of various age and size classes; 2) exhibit diversity of tree species; 3) have reduced threat from insect, disease, and wildfire; 4) be growing at or near optimum site productivity, and 5) provide suitable habitat to sustain minimum viable populations of all wildlife species (Forest Plan, IV-1-2, 116-139). A flow of sawlogs and other products would be produced to satisfy demands for forest products. Standards and guidelines specified in the Forest Plan will ensure that wildlife habitat for target or viable populations of all native vertebrate fish and wildlife species will be provided and, in some situations, will be improved by vegetation management.



SCOPE OF THE PROPOSED ACTION

The Moyer Salt Timber Sale and Salt Creek Timber Sale areas were determined to be suitable for timber harvesting and were delineated as timber sale areas in the 1983 Forest Plan. Timber harvesting in these areas is currently ready for a decision concerning proceeding with site-specific harvesting and road construction in these sale areas. Although the proposed timber harvest activities on each of these two timber sales could proceed independently of the other, they were combined into one timber sale (the "Moyer Salt Timber Sale") and are addressed as one sale in this EIS because: 1) they are geographically close and their transportation systems overlap; 2) the potential for cumulative environmental effects can be assessed; and 3) the timing of one sale can be easily controlled to allow for use of wildlife subdivisions.

The scope of the proposed action is limited to the specific timber harvesting, forest regeneration, road construction and reconstruction, and associated activities identified in Chapter II. This final EIS is a site-specific National Environmental Policy Act (NEPA) document that addresses the effects of only these activities. The proposed action is not a general management plan for the area, and this is not a programmatic EIS.

DECISIONS TO BE MADE BASED ON THIS ANALYSIS

Based on the analysis documented in this environmental impact statement, the Salmon National Forest Supervisor will make the following decisions:

* **Should the Moyer Salt Timber Sale Area be entered for timber harvest and management-related activities at this time?**

If it is decided to enter the area for timber management now,

* **How much timber should be harvested?**

* **By what methods should the timber be harvested?**

* **What management requirements, mitigation measures and monitoring are necessary to protect other resources and to achieve other resource goals, objectives and desired future conditions?**

THE NEPA PROCESS

This Final EIS was developed under the implementing regulations of the National Environmental Policy Act (NEPA), Council on Environmental Quality (CEQ), Title 40, Code of Federal Regulations, Parts 1500 - 1508 (40 CFR 1500 - 1508); and the National Forest Management Act (NFMA), Title 36, Code of Federal Regulations, Part 219 (36 CFR 219).

NEPA analysis began with the identification of the proposed action as published in the Notice of Intent. This proposal was based on Forest Service knowledge of the current condition of the area and Forest Plan direction. The proposed action was the starting point for a detailed, site-specific NEPA analysis of the potential environmental effects of the proposed action.

A 45 day public comment period was allowed after the issuance of the Draft Environmental Impact Statement (DEIS). Comments were read, categorized and coded into a computer program specifically designed for content analysis.

Public comments were used by the Interdisciplinary Team and Forest Supervisor to scope additional issues not previously considered; evaluate the need for revising and analyzing new alternatives; and choosing a preferred alternative.

A 30 day public comment period will begin after issuance of this Final Environmental Impact Statement (FEIS) and publication of the notice of availability in the Federal Register.

A Record of Decision will be released after the public comment period. If the Forest Supervisor selects an action alternative in the Record of Decision, implementation of the activities specifically identified in that alternative would begin in 1993 and without further NEPA documentation.

APPEAL PROCESS

A 45 day appeal period will follow the Record of Decision.

FINAL EIS DOCUMENT ORGANIZATION

This document consists of the following main chapters:

Chapter I - Purpose of and Need for Action: Describes the proposed action, purpose of and need for action, Forest Plan direction, project area location, decisions to be made, scoping, and issues and concerns associated with the proposal.

Chapter II - Alternatives: Describes seven alternative ways (including taking no action) of addressing or resolving environmental issues and management concerns related to implementation of this proposal. How the six action alternatives wholly or partially meet the purpose of and need for the proposed action is described. A comparison is made of the environmental impacts and effects of each alternative.

Chapter III - Affected Environment: Discusses the existing environment affected by the alternatives by resource. Forest Plan management direction, the scope of analysis, the existing condition, and the effects of past management of each of the specific resources is discussed.

Chapter IV - Environmental Consequences: Discloses the environmental consequences of implementing the alternatives, using the descriptions in Chapter III as the baseline for measurement. Potential direct, indirect and cumulative effects are described and the effectiveness of mitigation measures is assessed. Unavoidable adverse effects are listed, including irreversible and irretrievable commitments of resources.

Chapter V - List of Preparers: Contains a listing of the individuals who contributed to this Final EIS, including names, educational qualifications, and years of direct experience relating to resource management.

Chapter VI - Public Involvement and Comments: Includes a summary of scoping and public involvement activities prior to the Final EIS.

Bibliography: Provides the sources for all material referenced in the text.

Glossary: Defines terms used in the text that may be unfamiliar or specialized. Acronyms are defined with their first usage in the text.

Appendices: Contains the biological assessments and evaluations, analytical reports, and site-specific or supplementary information that adds depth to the discussions in the main chapters.

Index: Provides a chapter or section and page reference for key words in the body of the EIS and appendices.

Comment Letters and Response: contains public comment letters on the DEIS and the Salmon National Forest's response to these comments. This section was printed and bound separate from the main document and is a supplement to Chapter VI - Scoping and Public Involvement

A **Project File** was created during development of the Final EIS that contains the background data, supporting documentation, issues analysis, ID team meeting notes, maps and other pertinent material. The project file is located in the Salmon National Forest Supervisor's Office.

SCOPING AND THE IDENTIFICATION OF ISSUES

Internal Scoping and the Public Involvement Process

An interdisciplinary team (ID Team) with members representing various affected resources was created early in the NEPA analysis process. This team reviewed management direction given in the Forest Plan and other documents, and initiated discussion with other Forest Service personnel regarding the proposed action and its potential effects on the area

resources. This internal scoping process identified potential issues related to implementation of the proposed action that would be addressed in the EIS (See Project File, Public Involvement: ID Team meeting notes). Other agencies with jurisdiction in the analysis area were notified of the proposed action and invited to comment.

Additional issues were identified during the public involvement process. Scoping and public and interagency involvement activities are discussed in more detail in Chapter VI of this document. During the public participation process, individuals expressed concerns and provided insights which helped resolve possible resource conflicts. Concerns and insights were documented (see Project File, Public Involvement: Comments and ID Team meeting notes) and then tracked through the analysis process (Project File, Issues Analysis).

During the public involvement scoping process, numerous topics were mentioned as possible concerns relating to road construction and timber harvesting. A list of the topics raised and the parties who brought them to the attention of the Salmon National Forest can be found in Chapter VI. These topics were addressed by the Forest staff of resource specialists, and, based upon their recommendations, were either analyzed in the Final EIS or, for specific reasons, found inappropriate for further analysis in this EIS.

Additional comments received during the public comment period that followed issuance of the Draft EIS were analyzed and discussed in the Final EIS. These included three new alternatives which were analyzed in detail.

ENVIRONMENTAL ISSUES AND CONCERNS

Issues that were identified in the scoping process and discussed in this EIS include those issues or concerns that displayed a concern that the proposed management action might 1) yield a detectable effect to the human environment, 2) and/or be highly controversial, 3) and/or fall within the scope of this site-specific EIS. As directed by the CEQ regulations, the level of analysis and disclosure of these issues is proportional to the importance of the issue in the context of the proposed activities (40 CFR 1502.2(b)). Thus, some issues are discussed in more depth than others throughout this document. The topics recommended for in-depth analysis include: vegetation, wildlife, roadless character, and economics, soils, water quality, fisheries, biological diversity, Threatened, Endangered and Sensitive Species, and visual resources. Other issues discussed include: recreation, air quality, transportation and access, cultural resources, mineral resources, and range resources. Concerns for these resources and mitigations that address those concerns are discussed in the following chapters of this EIS.

VEGETATION

How would the age structure, species abundance and composition, and growth potential of the vegetation be affected?

Timber harvesting affects the age structure, species abundance and composition, and growth potential of timber stands. The amount of change depends on: how many acres in a stand are harvested and how they are harvested; the ages of the harvested units and the amount of time necessary to regenerate the stand (age structure); the numbers and kinds of trees that are harvested from a stand and the species that regenerate on the site (species abundance and composition); and the number of stands that currently have little or no growth that would be converted to young stands with high growth rates; and the post-sale timber management activities that occur (growth potential).

Indices: The indices used to measure the effects of the alternatives on age structure, species abundance and composition, and growth potential are 1) the number of acres harvested; 2) the change in age class distribution before and after timber harvest; and 3) the change in species diversity.

What effect would the proposed action have on the health (particularly the insect and disease susceptibility) of the timber stands?

The overall health of the timber stands in the analysis area is such that noticeable change will occur in the next 60 to 70 years regardless of human activity. Risk of substantial damage due to insect epidemics

or large-scale wildfires is high. Mortality and growth losses from agents such as Western spruce budworm and dwarf mistletoe are occurring and will increase, particularly if the current drought conditions continue. Removing dead and infected timber stands would not only keep the infection from spreading to other stands but would reduce the potential for wildfires. Timber harvest activities also increases the risk that noxious weeds would be introduced to the site. A weed control program is currently in place on the Forest to control the spread of weeds.

Indices: The index used to measure the effects on the health of the forest is 1) the change in degree of infestation by insects and diseases, and 2) the risk of infestation by noxious weeds.

How can the full site productivity of these Management Areas (MAs) be managed to ensure an adequate supply of timber? What timber products would be produced from these MAs?

Concern has been expressed for the retention of local customs and culture through maintenance of employment and associated economic activity related to the harvesting and processing of timber. Timber industry representatives in eastern Idaho and southwestern Montana has stressed the importance of maintaining an adequate supply of timber. Larger trees that can be used for sawtimber are in demand, and uses of non-sawtimber stands include post and poles, firewood and house log products. Timber management practices that improve the productivity of the Forest would give future timber managers a wider array of harvesting options.

Indices: The index used to measure the effects of the alternatives on timber outputs is the volume production in million board feet (mmbf).

WILDLIFE

What are the potential effects of the proposed action on elk and deer?

Elk and deer security and elk habitat potential are of concern in the analysis area. Approximately half of the analysis area has been mapped as key elk summer range (areas of the elk summer range that receive exceptionally heavy use and are important to survival and/or productivity). The entire area receives heavy spring, summer and fall elk and mule deer use and limited elk and deer winter use. Timber harvesting and road construction may cause temporary or short term displacement of elk and deer from these areas of preferred habitat. They move from areas of optimal habitat to areas of less optimal habitat, and experience a change in habitat parameters such as security and forage base. Disturbance close to or displacement from an elk calving and deer fawning area might affect the number of young surviving to adulthood.

Elk habitat potential (EHP) is used to assess the effects to elk and deer; although these two big game species have different habitat requirements, they are similar enough that one index can be used. Elk have much more sensitive habitat requirements, particularly in terms of hiding cover, and therefore meeting elk habitat requirements would also meet those of deer. EHP is determined by using cover:forage ratios and road densities. Cover is vegetation that provides shelter from weather (thermal cover) or will hide 90 percent of an animal from a human's view at 200 feet or less (hiding cover). Forage areas are man-made or natural openings that provide food. A cover:forage ratio of 40:60 is considered optimum for most habitat types. Road densities are calculated using the miles of open (open road density) or closed (closed road density) road for each square mile. An EHP of 100 percent (cover:forage ratio is 40:60 and road density is 0 miles per square mile) is optimal. Timber harvest would affect the composition of vegetation in the analysis area and therefore the cover:forage ratio; it could improve the cover:forage ratio in heavily forested areas with few openings. Road construction would increase the road density of the area and thus lower the EHP, however, all new roads in the analysis area would be closed after timber harvesting.

Habitat requirements for calving and non-hunting-season security are presently adequate. This harvest and road building process has the potential to reduce habitat security for big game, as construction of new roads would facilitate access to the area by hunters even if they are closed.

Indices: The indices of measurement that will be used to evaluate the effects of the alternatives on elk and deer will be: 1) elk habitat potential (EHP) (derived from cover-forage ratio and road density); 2) elk habitat security; and 3) elk vulnerability.

What are the potential effects of the proposed action on old growth-dependent species?

Goshawk and pine marten both require timber stands with old-growth characteristics for nesting and/or hunting. Goshawk are dependent on even-aged old-growth Douglas-fir, lodgepole pine, and other tree species, and pine marten require old-growth spruce-fir forests for survival. These species could be affected by the proposed management activities. Although none of the old-growth retention stands identified in the Forest Plan (Forest Plan, page IV-19, and map of record) would be harvested, other stands which are currently in an old growth condition but were not designated for retention in the Forest Plan would be affected.

Indices: Indices of measurement for goshawk and pine marten will be: 1) the number of acres of timber stands with old growth characteristics within the analysis area before and after timber harvest; and 2) acres of Forest Plan designated old-growth retention stands that are cut.

ROADLESS CHARACTER

What are the potential effects of the proposed action on the Taylor Mountain Roadless Area?

Much of the proposed timber harvest would occur within the Taylor Mountain Roadless Area boundary; the proposed activities would affect approximately 16 percent of the entire roadless area. The Taylor Mountain Roadless Area is one of 30 areas on the Salmon National Forest inventoried as meeting the minimum requirements for wilderness. In the Forest Plan the proposed harvest areas within the roadless area have been allocated to non-wilderness management prescriptions, including management areas that prescribe timber management. However, most of the remainder of the Taylor Mountain Roadless Area falls under Management Area 2A, which emphasizes dispersed motorized semi-primitive recreation opportunities and is not classed as available for timber harvest unless the timber is damaged by fire, windthrow, or other catastrophic event (Forest Plan, IV-98-100).

The construction of roads and the harvest of trees in a roadless area has a direct effect on the social, physical and biological attributes of the area. These activities also make it unlikely that Congress would consider the analysis area for inclusion in the National Wilderness Preservation System (NWPS) if an action alternative is selected. The roadless areas also provide habitat for elk and other wildlife and are therefore important to wildlife managers and sportsmen. Other individuals simply value land without roads or developments and wish to preserve it for the future. They are concerned about the cumulative effect of removing areas, or even small portions thereof, out of a roadless condition.

Indices: Indices of measurement that will be used to measure the effects of the proposed action on the roadless character are: 1) whether or not the Taylor Mountain Roadless Area meets the qualifications for further consideration as a wilderness area; 2) number of acres within the inventoried roadless area boundary that would no longer be roadless; 3) the percent of the Taylor Mountain Roadless Area that is no longer roadless; and 4) the effects on the natural integrity, apparent naturalness, primitive recreation, solitude, special features, and special places and activities of the area.

ECONOMICS

Is Forest management of timber resources economically efficient?

Concern has been raised that the proposed project would not be economically efficient. Some respondents state that timber sales should stress cost efficiency and should result in long-term positive cash flow. However, the Multiple Use - Sustained Yield Act of 1960 (16 U.S.C 528) and the National Forest Management Act of 1976 (Public Law 94-588) requires that the renewable surface resources of the National Forests be managed such that consideration is given to the relative values of the various resources and not necessarily the combination of uses that will give the greatest dollar return or the greatest unit output.

Timber sales should contain the most efficient combination of logging methods, road systems, and silvicultural prescriptions to meet the objectives of the timber sale and other resources in the area. Economic analysis evaluates the costs and benefits of management alternatives to ensure that efficient methods of achieving objectives are considered in choosing an alternative. Relative economic efficiency of the alternatives is usually measured in terms of present net value (PNV). These measurements are calculated using the number of board feet sold, post-sale costs, and the cost of road construction. Timber production lost due to not bringing a timber stand that has reached or passed maximum productivity under management and into production should also be accounted for.

Indices: The indices of measurement for comparison of the economic efficiency of the alternatives will be: 1)Present Net Value (PNV); and 2) the gross stumpage value realized or lost; and 3) road costs.

SOILS

How would the proposed activities affect the soil resources?

Timber harvest activities may affect soil productivity by increasing sedimentation (and subsequent loss of soil), soil compaction, soil displacement, and potential for mass wasting. The ability of the soils to produce vegetation may be compromised if soil productivity is decreased.

Soil disturbance associated with timber harvest can cause accelerated soil erosion and lead to increased sediment in streams, degrading water quality and fish habitat. Soil disturbance occurs when roads and landing areas are constructed and when logs are skidded to the landing areas. Soil compaction occurs in areas where heavy machinery is used such as roads, landings and skid trails, and can decrease the porosity of the soils. Indirectly, timber harvest activities can cause mass-wasting, especially road cuts and fills, in soils with high mass wasting potential. Timber harvest activities can also directly affect soil resources by committing the land to uses other than growing vegetation for extended periods of time, particularly in roads and landing areas.

Indices: Indices for measurement of the effects to soils are: 1) acres of total soil resource commitment; 2) percent of analysis area with total soil resource commitment; 3) existing roads; and 4) new roads.

HYDROLOGY

Will the proposed timber harvest activities affect the water quality or volume in streams in the analysis area?

Concern has been expressed that the proposed timber harvest activities may increase sedimentation into streams in the analysis area. Soil disturbance associated with road construction and timber harvesting can lead to increased erosion rates and therefore an increase in the amount of sediment in streams, degrading water quality and affecting fish habitat and beneficial uses of the stream. Removal of vegetation and soil exposure can also increase sedimentation rates. Additionally, removal of vegetation can increase the peak flow rate and change the timing of peak flow during runoff. Increased peak flow can lead to changes in stream channel and bedload and can cause scouring and erosion of stream banks. The amount that vegetation removal affects the peak flow rate is directly correlative with the percent of a drainage that is harvested.

Indices: The indices of measurement to determine effects to water quality and volume are: 1) percent of drainages harvested; 2) state water quality standards are met; 3) beneficial uses are maintained; and 4) predicted change in water yield.

WETLANDS

How will the proposed timber harvest affect wetlands? Will timber harvest occur in wetlands?

The effects of the proposed timber sale on wetlands, particularly as they relate to water quality, was a concern expressed by some respondents during the scoping process. Wetlands serve an important role in maintaining water quality by acting as a filter to catch sediment or other impurities in surface water. Removal of vegetation or construction of roads or skid trails in wetlands would impair this function. Forest Service policy dictates that no tim-

ber harvest or road construction will occur in wetland areas, but they must be identified before they can be avoided.

Indices: The index of measurement to determine effects to wetlands is the acres of wetlands that are affected.

FISHERIES

How will road construction and timber harvesting affect spawning, incubation, and rearing habitats of anadromous and resident fish?

Resident and anadromous fisheries within and below the proposed sale areas are of great concern to the public and government agencies, including the National Marine Fisheries Service and the Columbia River Inter-Tribal Fish Commission. The spring-summer run of Chinook salmon has recently been listed as Threatened under the Endangered Species Act, and habitat for this fish species is present in the analysis area, although it is not currently being used. Effects to this habitat as a result of the proposed timber sale are therefore a concern.

The fisheries issues are closely tied to soil and water issues. Increases in the natural sedimentation rate due to soil disruption associated with timber harvest, particularly road construction activities, may affect fish habitat for both anadromous and resident fish species. Increases in sedimentation may cause fine sediment to be deposited in spawning gravels and impede fry emergence. Disruption of the bedload due to increased peak flow rates can also affect spawning gravels.

Indices: The index of measurement for effects to fisheries is whether anadromous and resident fisheries habitat are maintained.

BIOLOGICAL DIVERSITY

The general concern is that some species are going extinct at an alarming and un-natural rate. Loss of habitat (loss of ecosystems and fragmented non-functional landscapes) is the number one reason for extinction of species. Management activities may change landscape (and ecosystems) structure and function beyond the range of natural variation and result in decreasing biological diversity.

The effects to biological diversity are discussed in the wildlife, vegetation, and Threatened and Endangered, and Sensitive Species sections in Chapter IV, as well as a separate section called biological diversity. Additional information on biological diversity can be found in Appendix H.

THREATENED, ENDANGERED AND SENSITIVE SPECIES

Effects to federally listed Threatened, Endangered and Proposed species and to the Forest Service's Intermountain (R4) Regional Office's Sensitive species is a concern for maintenance of both biological diversity and the wildlife resources of the area.

Habitat for listed threatened spring/summer chinook is present in Moyer Creek and potential habitat is present in Woodtick Creek, although neither is used at present by this species because of downstream water pollution. In addition, an existing culvert presents a barrier to migration of steelhead through the middle reaches of Woodtick Creek. Sedimentation from project activities can reduce these stream's fish habitat capability, and road crossing of these creeks could create migration barriers.

Potential habitat for the Endangered gray wolf exists in the area and the entire analysis area is within the Central Idaho Wolf Recovery Area. However, no wolves are known or suspected to occupy the area at this time and no observational reports have been received from this area.

Prey populations, especially elk, are currently adequate to support pack activity on the Cobalt Ranger District, including this specific area. However, the entire Panther Creek drainage, including the Moyer Creek tributary, has been permanently altered by roads and yearlong human presence and habitation.

Several Sensitive vertebrate species or their habitat are present in the analysis area, including: North American lynx, wolverine, northern three-toed

woodpecker, great gray owl, western big-eared bat, boreal owl, northern goshawk, and spotted frog. Manipulation of the vegetation in the area could result in modification or destruction of these species' habitat. Sensitive plant species could also be affected by vegetation manipulation and road construction, however, none are known to occur here.

Indices: The indices of measurement of effects to these species are: 1) presence of Threatened, Endangered or Proposed species and/or their habitat; 2) presence of Forest Service, Intermountain Regional Office Sensitive species and/or their habitats; and 3) effects to potential and/or occupied habitat for both 1 and 2 above.

VISUAL RESOURCES

How will visual quality be affected as seen from within and outside the analysis area?

Road building and timber harvesting can change the visual appearance of an area as seen from trails, roads, and other locations. Portions of the analysis area that will be affected by these activities can be seen from the Moyer Creek Road and the Ridge Road.

Indices: The index of measurement of effects to visual resources is: 1) whether the visual quality objectives are met; and 2) the number of units not meeting VQO.

RECREATION

How will the recreation setting and opportunities be changed? How will recreation use change?

Current recreation use in the analysis area is primarily related to big game hunting in the fall. Access to the area is limited , and recreation use is light. The quality of the current recreation uses and the kinds of recreation opportunities would change as a result of the proposed timber harvest activities, and how that would affect the amount and types of recreation use is a concern.

Indices: The index of measurement of effects to recreation use is the number of acres converted from semi-primitive motorized and non-motorized to roaded-natural appearing.

AIR QUALITY

How will the proposed timber harvest activities affect the air quality of the analysis area?

This issue looks at how the proposed project activities would affect the air quality in the area and if stated air quality standards will be met.

Timber harvest activities increase the amount of dust in the air in the vicinity of the project area and during project implementation due to construction and use of roads. Slash burning will degrade air quality in the analysis area and downwind of it, and may affect persons travelling on the Ridge Road and other roads in the area. Smoke due to slash burning may be visible for several miles, depending on weather conditions and dispersion patterns.

Indices: The indices of measurement for air quality are whether the State air quality standards are exceeded.

TRANSPORTATION AND ACCESS

How will the construction of the proposed transportation system affect future use of the timber resource in the area? How will access to the area be changed?

The development of a transportation system that allows use of Forest resources is an issue in the Moyer Salt Timber Sale area. Road access to the analysis area is currently limited, and the timber resource in the area cannot be utilized. Construction of new roads will not only provide access to the timber proposed for harvesting under the action alternatives but will also affect future access to other timber resources in the area.

Also at issue is how access to the sale areas for recreational use would change under the alternatives. Existing timber roads in the Salt Creek portion of the timber sale are gated and closed to motorized use to protect big game habitat. All new roads constructed for access to the timber sale area would also be gated and closed. In addition, a portion of

Roads 60286.1, 60286-C, and 60288 will have construction slash placed on the roads, after timber removal, for the purpose of impeding foot and horse traffic on the new road system. This mitigation measure will only be installed on roads which may be readily accessed by the Moyer Peak Jeep Trail which will remain open.

Indices: Indices for measurement of the effects of the different transportation systems proposed for the alternatives are 1) the number of acres available for timber harvesting with the existing road system; 2) the number of acres available for timber harvesting with the proposed road systems; 3) the miles of road that would be constructed or reconstructed; and 4) miles of open road and closed road in the analysis area.

MINERALS

How will the mineral resources of the analysis area be affected?

This issue looks at how the proposed timber harvest activities would affect potential mineral development in the analysis area. Increased access into the area could cause an increase in mineral exploration activity in the area, and more exposure of bedrock would occur in roads cuts and surfaces. However, mineral development may be limited as a result of the proposed activities because wildlife, water quality and other resource standards and guidelines in the Forest Plan may limit the number of acres of road or other surface disturbance that can occur in an area.

Indices: The index of measurement for effects to mineral resources is whether the proposed activities would interfere with potential mineral development.

CULTURAL RESOURCES

How will the cultural resources of the analysis area be affected?

Concern has been expressed that the proposed activities may impact cultural resources in the analysis area. Road construction could damage cultural resource sites or could provide better access to the site and may result in an increase in vandalism.

Indices: The index of measurement of effects to cultural resources is whether or not impacts will occur.

RANGE RESOURCES

What would be the effect of the proposed timber harvest on range resources?

Timber harvest can increase grazing by improving access and increasing forage or reduce livestock by fencing livestock out of areas. These changes can alter grazing levels, livestock use patterns, and rangeland conditions.

Indices: The index of measurement for range resources is the effects on range condition.

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Alternatives

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CHAPTER II

ALTERNATIVES, INCLUDING THE PROPOSED ACTION

CHANGES BETWEEN THE DRAFT AND FINAL

There are a number of changes in Chapter II between the Draft Environmental Impact Statement (DEIS) and the Final Environmental Impact Statement (FEIS). These changes were made in response to public comment on the Draft EIS and further analysis by the Interdisciplinary Team (ID Team), a group of specialists representing various resources and uses of the Forest, such as timber, wildlife, recreation, visuals, fisheries, soils, and water.

Three new alternatives have been developed (Alternatives 5, 6, and 2A) and studied in detail, along with four additional alternatives given consideration but not detailed study.

Alternative 5 was developed in response to comments received on the DEIS. It is intended to respond to requests that "a no roads access for timber harvest" be considered and that an alternative be considered that "addresses harvesting less than 3.0 MMBF and constructing less than 10 miles of road.

Alternative 6 was developed in order to provide a balance between concerns for visual quality and insect and disease conditions.

Alternative 2A was developed to respond to concerns about visual quality. It is designed to mitigate the visual effects of timber harvest when viewed from a landscape or background view.

CHAPTER REVIEW

A total of seven alternatives are considered in detail: a no action alternative plus six action alternatives. Each action alternative wholly or partially meets the purpose of and need for action while addressing the issues identified in Chapter I. This chapter contains sections on: (1) Alternative Development Process, (2) Alternatives Considered but not Given Detailed Study, (3) Alternatives Considered in Detail, (4) Management, Mitigation, and Monitoring Measures, and (5) Comparison of Alternatives. This information, along with the Chapter IV disclosure of projected environmental consequences of each alternative, provides information allowing the decision-maker to make a reasoned choice between alternatives.

ALTERNATIVE DEVELOPMENT PROCESS

The ID Team considered the following important elements when they developed the alternatives for this analysis:

- The goals, objectives, and desired future condition for the analysis area as outlined in the Forest Plan;
- The analysis for the 1983 Moyer Salt Timber Sale Environmental Assessment (EA) (see description under "Alternatives Considered But Not Given Detailed Study");
- Comments made by the public and other agencies during scoping; and
- The laws, regulations, and policies that govern management of the national forests.

ALTERNATIVES CONSIDERED BUT NOT GIVEN DETAILED STUDY

The ID Team considered the following alternatives and options during the analysis process, but they eliminated them from detailed study for the reasons described below:

- **Use the preferred alternative identified in the Moyer Salt Environmental Assessment (1983) as the proposed action for this Draft EIS.**

In 1982 the Forest Service proposed timber harvesting and road construction in the Woodtick Creek and Salt Creek drainages (the Moyer Salt Timber Sale) that would harvest 4 to 8 mmbf from 1,000 to 1,400 acres. An Environmental Assessment (EA) was approved that documented an environmental evaluation of the proposed timber harvesting and road construction with a reasonable range of management action alternatives (U.S. Forest Service 1982). This evaluation did not assess the effects of the proposed action on the roadless character of the area. A Finding of No Significant Impact (FONSI) and Decision Notice were signed by the Forest Supervisor in May, 1983. The timber sale was marked and offered for sale but was not purchased due to depressed timber prices in the mid-1980s. In 1988 the Forest Plan was approved; it designated the Moyer Salt Timber Sale area as an area where timber harvesting could occur. In 1991 the decision was made to enter the area for timber harvesting. The timber harvesting and road construction activities proposed in the original Moyer Salt Timber Sale were modified to meet the current standards and guidelines of the Forest Plan, and are contained in the proposed alternative (Alternative II in this document).

- **Complete a separate EIS analysis for each of two timber sales originally proposed in the Moyer Salt Timber Sale EIS analysis area.**

As originally stated in the 1988 Forest Plan, two separate timber sales were proposed for what is now the Moyer Salt Timber Sale: the Moyer-Salt Timber Sale and the Salt Creek Timber Sale. These two timber sales were combined into a single sale, primarily to facilitate control of timing of road construction and timber harvesting in big game subdivisions. The two timber sales were not offered and their effects were not analyzed separately because: 1) this approach would not yield a clear disclosure of the potential environmental effects from the proposed action; 2) it would not be cost efficient; and 3) roads built to access the Salt Creek portion of the timber sale would also access the Moyer Salt portion; therefore, analyzing the effects of the two sales separately would be partially redundant and an inefficient use of time and resources.

- **Harvest timber only outside the Taylor Mountain Roadless Area.**

Comments to the DEIS suggested that we analyze this alternative. Our reason for dismissing further analysis follows. Nearly 50% of the Salmon National Forest's suitable timber base is located in roadless areas. The Forest Plan identified roadless lands within this analysis area as suitable for timber harvest. Failure to consider harvesting in roadless areas would lead to overcutting of nonroadless lands based on the current Allowable Sale Quantity. One of the purposes of this EIS is to address the effects of timber harvest activities on the roadless resource, thus this alternative would be outside the scope of this document. The No Action alternative approximates this alternative and if selected would allow the option to consider any number of timber sales outside the roadless area.

- **Prescribed burn alternative to address the forest health concerns.**

Due to public comments received after release of the DEIS, a prescribed burn alternative was considered but is outside the scope of this EIS because it does not meet the purpose of contributing, in part, to the Forest Plan objective of satisfying the commercial demand for timber. The Draft EIS, on page 1-1 states: "The proposed action alternatives are designed to help provide a continuous flow of raw materials to dependent manufacturing communities and thereby provide community stability. It is also designed to enable the public to gather firewood. All the proposed action alternatives are consistent with maintaining the customs and cultures of these communities."

- **Helicopter log 170 acres of Douglas-fir units and conventionally log 580 acres, requiring 15.8 miles of road (2.5 miles in Wildlife Area I and 13.3 miles in II) with an estimated yield of 6.0 MMBF.**

Due to public comments received after release of the DEIS, this alternative was considered but dropped from further analysis due to the increased costs of logging and transportation, and the relatively minor benefits to wildlife.

- **Helicopter logging the Douglas-fir units (170 acres) and conventionally log 170 acres, requiring 13.8 miles of road (only 0.5 miles of road in Wildlife area I to access heli-spot and all conventional units dropped in this area) with an estimated yield of 4.0 MMBF.**

This alternative like the previous one, was considered because of public comments received after release of the DEIS, but was dropped from further analysis due to the increased costs of logging and transportation, and the relatively minor benefits to wildlife.

ALTERNATIVES CONSIDERED IN DETAIL

Seven alternatives were developed and analyzed in detail, a no-action alternative and six action alternatives. Each action alternative represents a different combination of timber harvest and road building intensity, as well as slightly different methods for mitigating their effects. These alternatives were designed to meet the issues and concerns identified during scoping while at least partially meeting the purpose of and need for action defined in Chapter I, and represent a reasonable range of actions to accomplish those goals. The seven alternatives are described in the following pages, and the locations of cutting units and roads are shown on the accompanying maps.

The Forest Plan standards and guidelines that would be used during implementation of any of the action alternatives are designed to guide implementation of Forest management goals, such as timber management, while protecting other important resource values.

Harvest treatments prescribed for the proposed Moyer Salt Timber Sale apply even-aged silvicultural systems because these methods best meet the Management Area goals for the area established in the Forest Plan (pp. IV-32). Standard harvest methods for even-aged management of forests include clearcutting, seed tree, and shelterwood methods. Clearcutting and shelterwood or variations of the shelterwood systems including diversified forests methods are the optimum even-aged silvicultural methods for treating stand conditions in the Moyer Salt analysis area.

Clearcut Harvest

Standard clearcutting would be applied in areas with heavy fuel loadings, where residual overstory or understory trees can't be protected while harvesting, in areas susceptible to windthrow, and in stands infected with dwarf mistletoe. These conditions are found on subalpine fir habitat types consisting of relatively pure stands of lodgepole pine or mixed stands of lodgepole pine, subalpine fir, and Engelmann spruce. Even when it is possible to skid logs and save a residual stand, it is often not possible to dispose of the slash without clearcutting. However, wherever feasible, healthy residual understory trees will be left. This method would be utilized in Alternatives 2, 3, 4, and 5.

Alternatives 6 and 2A would utilize clearcutting with islands in order to meet visual quality objectives and mitigate other resource concerns. Where clearcutting is prescribed, many of the stands would have approximately 15% of the area within the unit left in uncut islands ranging from 1/2 an acre to one acre in size. With heavy fuel loadings, such as those found in the analysis area, the retention of islands is the only practical and economically feasible alternative to standard clearcutting.

Regardless of which method is applied, there would be a variety of common treatments. Most units would be logged using tractor skidding methods; units with slopes too steep for tractor logging would be logged with a cable system.

After the trees have been removed from a site, a variety of activities would occur on the site that are designed to promote seedling establishment, improve timber stand conditions and reduce the amount of combustible material laying on the ground (fuel loading). Slash would be piled by tractors on sites with slopes less than 45 percent. In addition, ten to fifteen tons of slash would be left evenly scattered on each acre in order to provide microsites that enhance seedling establishment and survival, ensure long-term soil productivity and provide habitat for insects and animals. Any remaining unhealthy trees and insect-infected understory trees that were not pushed over during the piling process would be hand felled in order to increase growing space and completely remove any disease source. All remaining healthy understory trees would be maintained. Existing snags (large standing dead trees) and recruitment snags (trees that would be retained as future snags trees) would be maintained as per Forest Plan direction.

During logging, branches, tree tops, and small trees (slash) would be cut to lengths such that the slash would lie on the ground at depths of less than 1.5 feet. In some areas, this material would be made available to the public and commercial firewood gatherers for a designated time period after logging operations are complete. After firewood gathering, the slash would be burned to increase available growing space, to reduce the amount of dead material on the ground and thereby to reduce potential for wildfires, and to assist in the breakdown of woody material and increase soil productivity. Clearcut units on slopes steeper than 45 percent would be broadcast burned (burned without piling); on slopes less than 45 percent the slash would be burned in piles. Firelines would be constructed around harvest units to reduce the possibilities of fire escape during burning. Burning would be controlled so that 10 to 15 tons per acre of slash material, including larger diameter pieces of slash, would be retained to provide microsite protection, ensure soil productivity and maintain habitat for those organisms requiring down woody debris.

Natural seed sprouting would reforest the clearcut units. Natural seeding and regeneration of timber harvest cutting units on similar sites elsewhere in the Salmon National Forest has been successful. Clearcuts would be planted if reforestation by natural means is not successful. Timing of harvesting and slash disposal would be adjusted to ensure that the pine cones have dropped their seeds before the slash is piled.

Machine site preparation such as scarification would be used in units where grasses, sedges, or shrubs are present that may prevent or prolong seedling establishment. On approximately 50 to 100 acres of clearcutting units, a specially designed tractor blade will be used to overturn the sod layer and to loosen the top soil of an area in order to create a mineral soil seedbed where tree seeds can germinate.

Shelterwood Harvest

In stands where there are no young trees present on the site or where those that are present are unhealthy (they are infested with insects and diseases or will not grow if the competing trees are removed), a standard shelterwood method would be uniformly implemented (designated as "shelterwood" on Alternative maps). The initial entry would apply the seed cut of the shelterwood in which approximately fifty to seventy percent of the overstory depending on site conditions. The remaining "leave trees" would be expected to regenerate the site within 10-15 years. The actual time necessary to regenerate these sites would vary depending upon whether the topography was suitable for the application of machine scarification. Once regeneration is established, a removal cut of the shelter wood would be made leaving three to five large trees per acre for snag replacement or future harvest.

In stands where there are healthy young trees on the site that will grow if competing trees are removed, a group shelterwood method would be implemented (designated as group shelterwood on maps). Stands where this method is proposed are characterized by three distinct components:

1. A Douglas-fir overstory with an understory of Douglas-fir seedlings and saplings ranging from two to six feet tall;
2. A Douglas-fir overstory with an occasional clump of regeneration but generally park like in appearance;
3. Thick patches of advanced Douglas-fir regeneration (pole size material 3.0 - 8.9 inches DBH).

These three components create a mosaic of even-aged groups. The objective of the group shelterwood method is to maintain these components as even-aged groups, thereby replicating nature's reproduction system. In the initial entry, this method takes advantage of the existing regeneration present. Where a suitable understory is present, a removal cut of the shelterwood would be performed to release existing regeneration. Where regeneration is lacking, the seed cut of a shelterwood would be implemented removing approximately 50 to 70 percent of the overstory depending on site conditions. Where existing patches of Douglas-fir regeneration is encountered a combination of precommercial and commercial thinning would be applied.

In order to meet visual quality objectives and mitigate other resource concerns, many of the units in Alternatives 5, 6 and 2A will be treated utilizing a modified irregular shelterwood system (designated "irregular shelterwood" on the Alternative maps). This method would be initially similar to the standard and group shelterwood methods described for

Alternatives 2, 3 and 4. The primary difference is that the shelterwood trees are retained longer than necessary for seedling establishment thus delaying the timing of the second entry into the stand. The removal cut (second entry) of the shelterwood, would not be performed until the average height of the regeneration is approximately 20 feet. The removal cut would therefore occur approximately 20 to 30 years after the seed cut as compared to 10 to 15 years when employing the standard or group shelterwood.

Regardless of which method is applied there would be a variety of common treatments. Most units would be logged using tractor skidding methods. Units with slopes greater than 45 percent would be logged using a cable system.

Machine scarification and slash piling by dozer would be performed as one operation in areas where a shelterwood seed cut is made. Fifty percent of these areas would be scarified by alternating strips of treated and untreated ground. Slash would be lopped and scattered prior to the scarification process. It would be evenly redistributed during the scarification process. These treatments would not be possible under Alternative 5 due to lack of road access. In cable units that are too steep to pile or scarify, the slash would be lopped and scattered or jackpot burned (areas where slash has accumulated in piles (jackpots) would be burned). In areas where a removal cut, slash would be lopped and scattered. No piling or burning would occur in order to protect healthy trees present on the site.

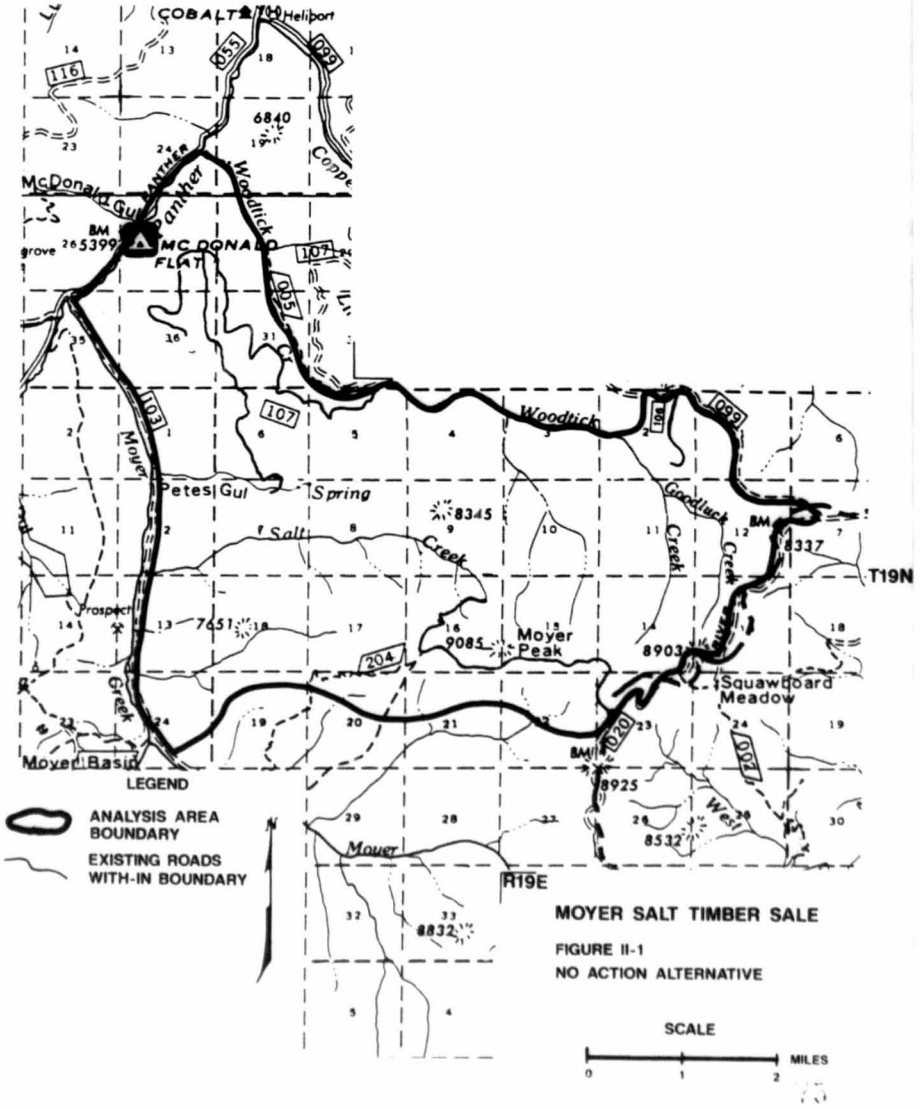
Young trees left in shelterwood units would be thinned (a cutting is made in the overstocked stands to bring stocking to the desired level and to increase growth in remaining trees). Trees that are damaged or unhealthy would be cut down by hand in order to provide growing space for new trees.

ROAD CONSTRUCTION AND RECONSTRUCTION STANDARDS AND GUIDELINES

Timber access roads in the analysis area would be built to Forest Service standards and guidelines. These road specifications are designed to ensure that these roads fit the topography and appearance of the land; are stable; do not erode or result in increased stream sedimentation; and could be used again for the next timber harvest entry. A description of road construction and reconstruction methods and specifications is contained in the Project File.

Both specified (roads designed by engineers as permanent roads) and temporary roads would be constructed as part of the timber sale (contained in Project File). The design and specifications for these roads are contained in the timber sale contract; the engineering administrator is responsible for ensuring that these specifications are met by the timber sale purchaser.

Under Alternatives 3, 4, 5, and 8, the first nine miles of existing Forest Service Road 107 in the lower Woodtick Creek area would be reconstructed so that it meets the same Forest specifications as newly constructed roads used for hauling logs. Under all of the action alternatives, a short segment of existing Forest Service Road 106 would also be reconstructed. Where existing drainage structures such as culverts, ditches, and dips are not performing adequately, these structures would be rebuilt before the roads would be used for hauling logs. Additional water dips would also be constructed to prevent extensive rutting.

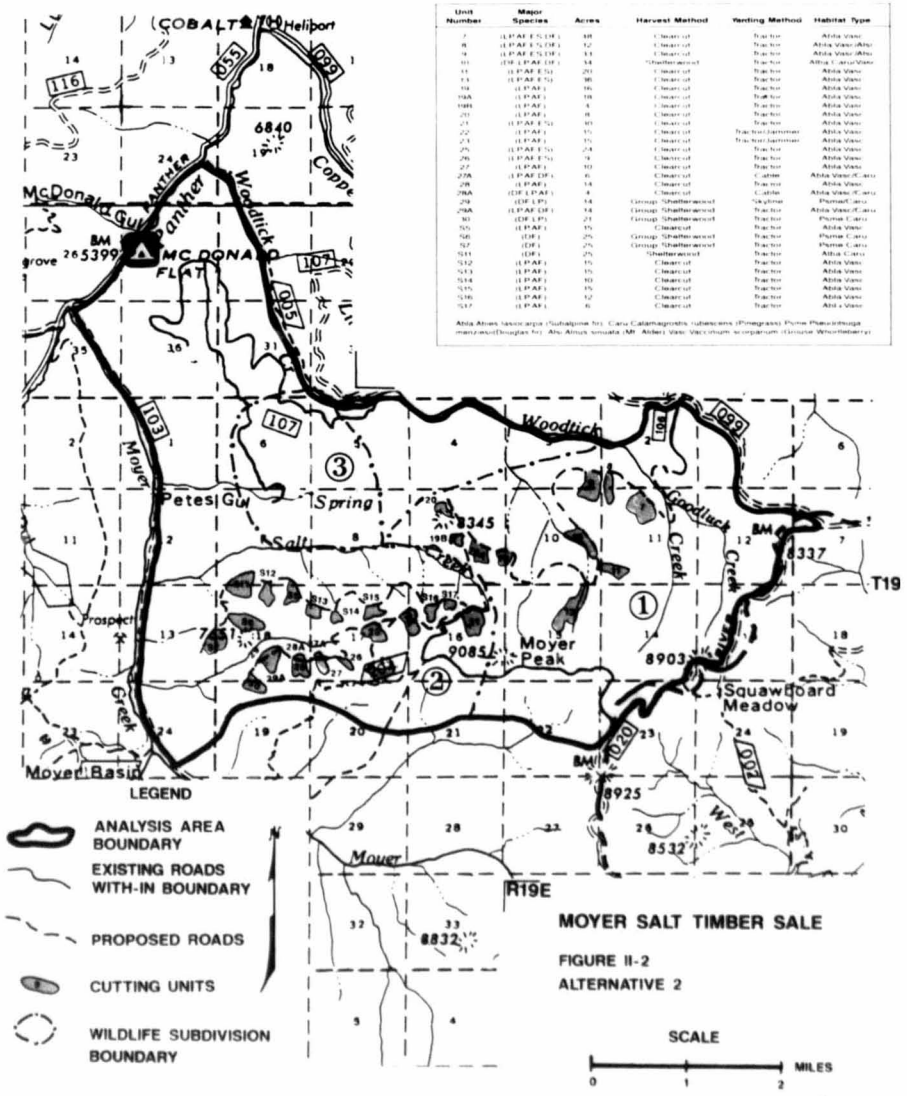


ALTERNATIVE 1 - NO ACTION

The No Action alternative would not initiate any activities; present resource management activities would continue, but the proposed project activities would not be implemented.

The goal of this alternative is to maintain the area's undeveloped condition and current uses (see Figure II-1). This alternative provides a baseline to compare the effects of the action alternatives, and responds to the roadless issue, or the desire to maintain the area in a roadless condition. Because the existing environment is not static, environmental consequences will still occur; natural events such as wildfire, insect and disease infestations, or flooding could appreciably alter most of the resources that are discussed in this document.

Total area that would be treated (acres)	0
Total volume that would be harvested (mmbf)	0
Miles of road that would be built (miles)	0
Number of cutting units:	
Douglas-fir	0
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	0
Clearcut Cutting Method:	
Amount clearcut (acres)	0
Logging Methods:	
tractor (acres)	0
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	0
broadcast burned (acres)	0
Machine Scarification (acres)	0
Shelterwood Cutting Method:	0
Amount Shelterwood (acres)	0
Logging Methods: tractor (acres)	0
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	
broadcast burned (acres)	
Machine Scarification (acres)	0



ALTERNATIVE 2

This alternative was used in the internal and public scoping process in an effort to implement Forest Plan direction and to identify issues which other alternatives are designed to address. This alternative emphasizes timber harvesting and natural regeneration that would improve the health and vigor of the forest while meeting all other resource needs.

Sale layout would be designed to meet resource objectives by limiting unit size, shape, and total acres treated. Optimum treatment of insect and disease conditions, and economic efficiency of harvesting may not occur in order that standards and guidelines for other resources may be met. Emphasis would be on maximizing sawlog production for those areas treated. In this alternative, the entire area would be accessed from one road, an extension of Forest Service Road 106 (Swan Peak Road) (Figure II-2).

Total area that would be treated (acres)	568
Total volume that would be harvested (mmbf)	4.9
Miles of road	
Constructed:	16.8
Reconstructed:	1.3
Number of cutting units	
Douglas-fir	7
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25
Clearcut Cutting Methods:	
Amount clearcut (acres)	410
Logging Methods:	
tractor (acres)	400
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	310
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	158
Logging Methods:	
tractor (acres)	144
cable (acres)	14
Slash Disposal Method:	
piled and burned (acres)	*
broadcast burned (acres)	0
Machine Scarification (acres)	144

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

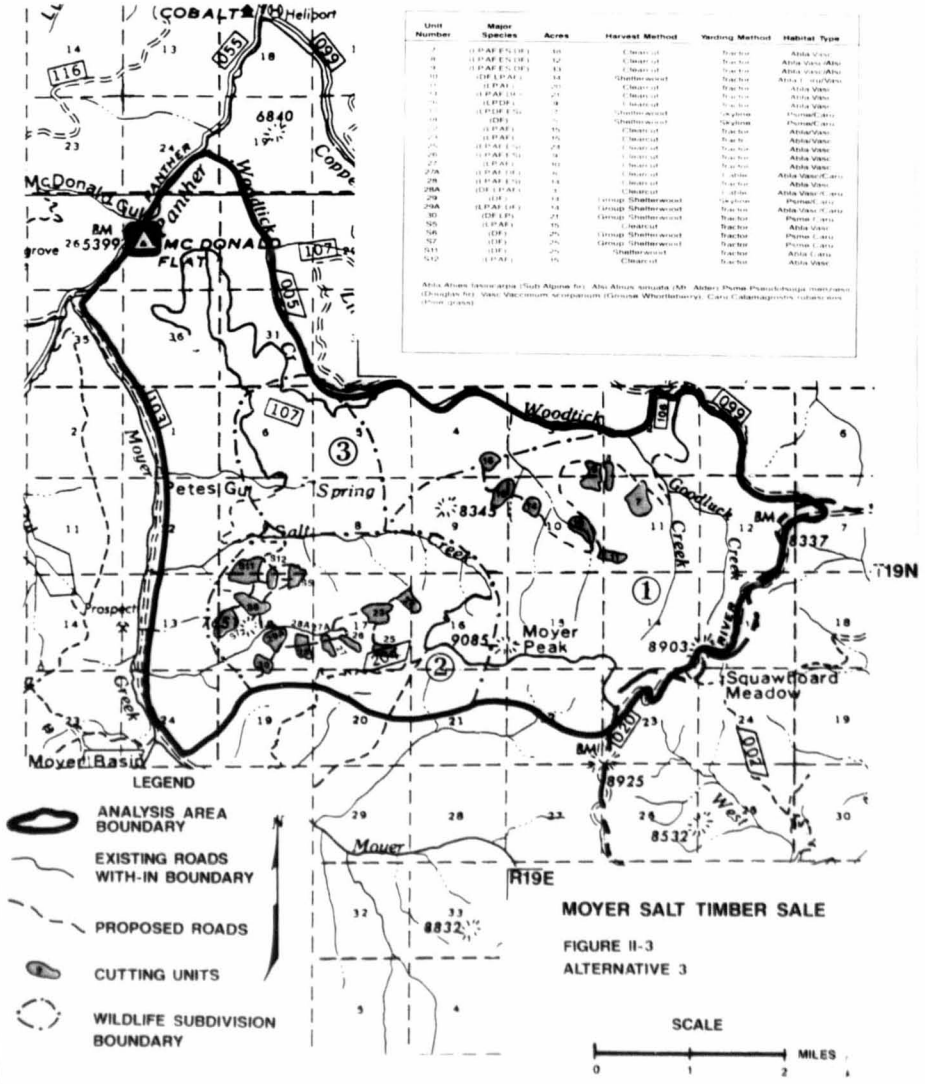
In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.



Unit Number	Major Species	Acres	Harvest Method	Yarding Method	Habitat Type
7	(LPAF,ES,DF)	16	Clearcut	Tractor	Abla Vasc
8	(LPAF,ES,DF)	52	Clearcut	Tractor	Abla Vasc/Abla
9	(LPAF,ES,DF)	63	Clearcut	Tractor	Abla Vasc/Abla
10	(DF,LPAF)	34	Shelterwood	Tractor	Abla Vasc/Vasc
11	(LPAF)	20	Clearcut	Tractor	Abla Vasc
12	(LPAF,DF)	23	Clearcut	Tractor	Abla Vasc
13	(LPDF)	9	Clearcut	Tractor	Abla Vasc
14	(LPDF,ES)	7	Shelterwood	Tractor	Poma/Caru
15	(DF)	5	Shelterwood	Skyline	Poma/Caru
23	(LPAF)	15	Clearcut	Tractor	Abla/Vasc
24	(LPAF)	15	Clearcut	Tractor	Abla/Vasc
25	(LPAF,Cw)	28	Clearcut	Tractor	Abla Vasc
26	(LPAF,ES)	9	Clearcut	Tractor	Abla Vasc
27	(LPAF)	62	Clearcut	Tractor	Abla Vasc
27A	(LPAF,DF)	5	Clearcut	Tractor	Abla Vasc/Caru
28	(LPAF,ES)	14	Clearcut	Tractor	Abla Vasc
28A	(DF,LPAF)	3	Clearcut	Tractor	Abla Vasc/Caru
29	(DF)	11	Group Shelterwood	Skyline	Poma/Caru
29A	(LPAF,DF)	13	Group Shelterwood	Skyline	Abla Vasc/Caru
30	(DF,LP)	21	Group Shelterwood	Tractor	Poma Caru
55	(LPAF)	15	Clearcut	Tractor	Abla Vasc
56	(DF)	25	Group Shelterwood	Tractor	Poma Caru
57	(DF)	25	Group Shelterwood	Tractor	Poma Caru
511	(DF)	25	Shelterwood	Tractor	Abla Caru
512	(LPAF)	15	Clearcut	Tractor	Abla Vasc

Abla Abies lasiocarpa (Sub Alpine fir), Abi Abies amiabi (Mt. Alder) Poma Pseudotsuga menziesii (Douglas fir), Vasc Vaccinium scoparium (Grouse Whortleberry), Caru Calamagrostis rubescens (Pine grass)

ALTERNATIVE 3

This alternative was developed to respond to concerns about the effects of the proposed action on wildlife, in particular the effects on key elk summer range. This alternative was developed with substantive input provided during the public comment period by members of the public.

This alternative eliminates 11 clearcuts totaling 170 acres contained in Alternative II and adds two clearcuts totaling 30 acres (Figure II-3). Access to the analysis area would be from two roads: cutting units in the Woodtick Creek area would be accessed by a road extending from the existing F.S. Road 106, and those in the Salt Creek and "Perm" Creek area would be accessed by a road extending from existing F.S. Road 107. The existing roads would be reconstructed to Forest road specifications. This configuration, with fewer clearcuts and access by two roads, would provide a large area in the center of the analysis area in which no harvesting or road building would take place.

Total area that would be treated (acres)	440
Total volume that would be harvested (mmbf)	3.75
Miles of road	
Constructed:	14.6
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	9
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	16
Clearcut Cutting Methods:	
Amount clearcut (acres)	270
Logging Methods:	
tractor (acres)	260
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	150
broadcast burned (acres)	120
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	170
Logging Methods:	
tractor (acres)	144
cable (acres)	26
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	144

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

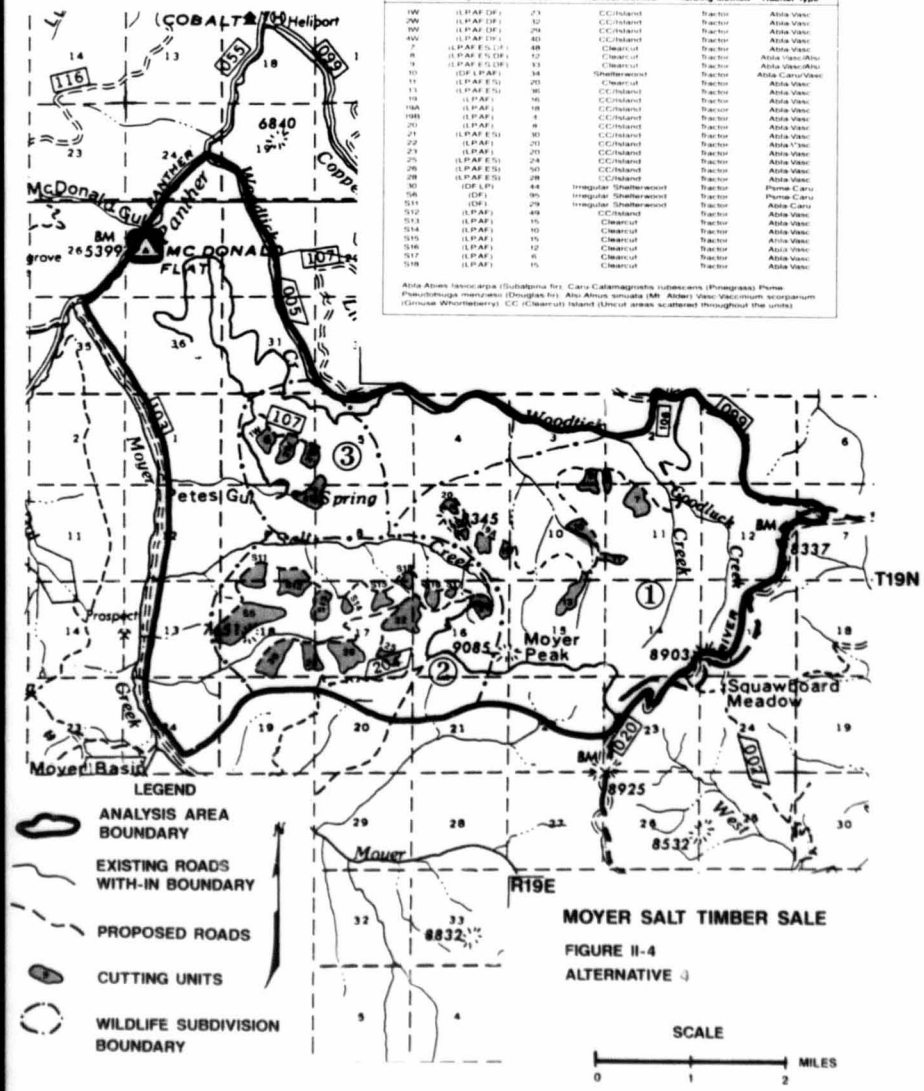
Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

Unit Number	Major Species	Acres	Harvest Method	Yarding Method	Habitat Type
1W	(LPAF DF)	23	CC/Island	Tractor	Abla-Vasc
2W	(LPAF DF)	32	CC/Island	Tractor	Abla-Vasc
3W	(LPAF DF)	29	CC/Island	Tractor	Abla-Vasc
4W	(LPAF DF)	40	CC/Island	Tractor	Abla-Vasc
7	(LPAF ES DF)	48	Clearcut	Tractor	Abla-Vasc
8	(LPAF ES DF)	12	Clearcut	Tractor	Abla-Vasc/Abu
9	(LPAF ES DF)	33	Clearcut	Tractor	Abla-Vasc/Abu
10	(DF LPAF)	34	Shelterwood	Tractor	Abla-Caru/Vasc
11	(LPAF ES)	20	Clearcut	Tractor	Abla-Vasc
13	(LPAF ES)	36	CC/Island	Tractor	Abla-Vasc
19	(LPAF)	16	CC/Island	Tractor	Abla-Vasc
19A	(LPAF)	18	CC/Island	Tractor	Abla-Vasc
19B	(LPAF)	4	CC/Island	Tractor	Abla-Vasc
20	(LPAF)	8	CC/Island	Tractor	Abla-Vasc
21	(LPAF ES)	30	CC/Island	Tractor	Abla-Vasc
22	(LPAF)	20	CC/Island	Tractor	Abla-Vasc
23	(LPAF)	20	CC/Island	Tractor	Abla-Vasc
25	(LPAF ES)	24	CC/Island	Tractor	Abla-Vasc
26	(LPAF ES)	50	CC/Island	Tractor	Abla-Vasc
28	(LPAF ES)	28	CC/Island	Tractor	Abla-Vasc
30	(DF LP)	44	Irregular Shelterwood	Tractor	Pime-Caru
5A	(DF)	95	Irregular Shelterwood	Tractor	Pime-Caru
S11	(DF)	29	Irregular Shelterwood	Tractor	Abla-Caru
S12	(LPAF)	49	CC/Island	Tractor	Abla-Vasc
S13	(LPAF)	15	Clearcut	Tractor	Abla-Vasc
S14	(LPAF)	10	Clearcut	Tractor	Abla-Vasc
S15	(LPAF)	15	Clearcut	Tractor	Abla-Vasc
S16	(LPAF)	12	Clearcut	Tractor	Abla-Vasc
S17	(LPAF)	6	Clearcut	Tractor	Abla-Vasc
S18	(LPAF)	15	Clearcut	Tractor	Abla-Vasc

Abla Abies lasiocarpa (Subalpine fir); Caru Calamagrostis rubescens (Pinegrass); Pime Pseudotsuga menziesii (Douglas fir); Abu Alnus sinuata (Mt. Alder); Vasc Vaccinium scorparium (Grouse Whortleberry). CC (Clearcut) Island (Uncut areas scattered throughout the units)



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ALTERNATIVE 4

This alternative was developed to respond to concerns about the economic viability of the other action alternatives and their effectiveness in treating insect and disease conditions within the project area. Alternative 4 implements the timber management direction of the Forest Plan to its fullest and may not meet resource objectives for other resources.

Most of the cable logging units contained in Alternatives 2 and 3 would be eliminated in order to increase the economic efficiency of the proposed action (Figure II-4). Cutting unit size was determined by Forest Plan Silvicultural and Insect and Disease standards and guidelines that are designed to maximize growth, health, and vigor and minimize insect and disease infestation of the treated stands. Clearcut cutting unit size may reach 60 acres in lodgepole pine stands where dwarf mistletoe levels are high (unit # 22). Shelterwood unit size in Douglas-fir stands, designed to control Douglas-fir beetle and Western spruce budworm, would exceed 40 acres (unit # 30). The size of these units was determined by the amount and size of existing natural regeneration and the size of natural openings used by big game.

Total area that would be treated (acres)	847
Total volume that would be harvested (mmbf)	6.9
Miles of road	
Constructed:	17.8
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	5
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25
Clearcut Cutting Methods:	
Amount clearcut (acres)	645
Logging Methods:	
tractor (acres)	645
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	545
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	202
Logging Methods:	
tractor (acres)	202
cable (acres)	0
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	202

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

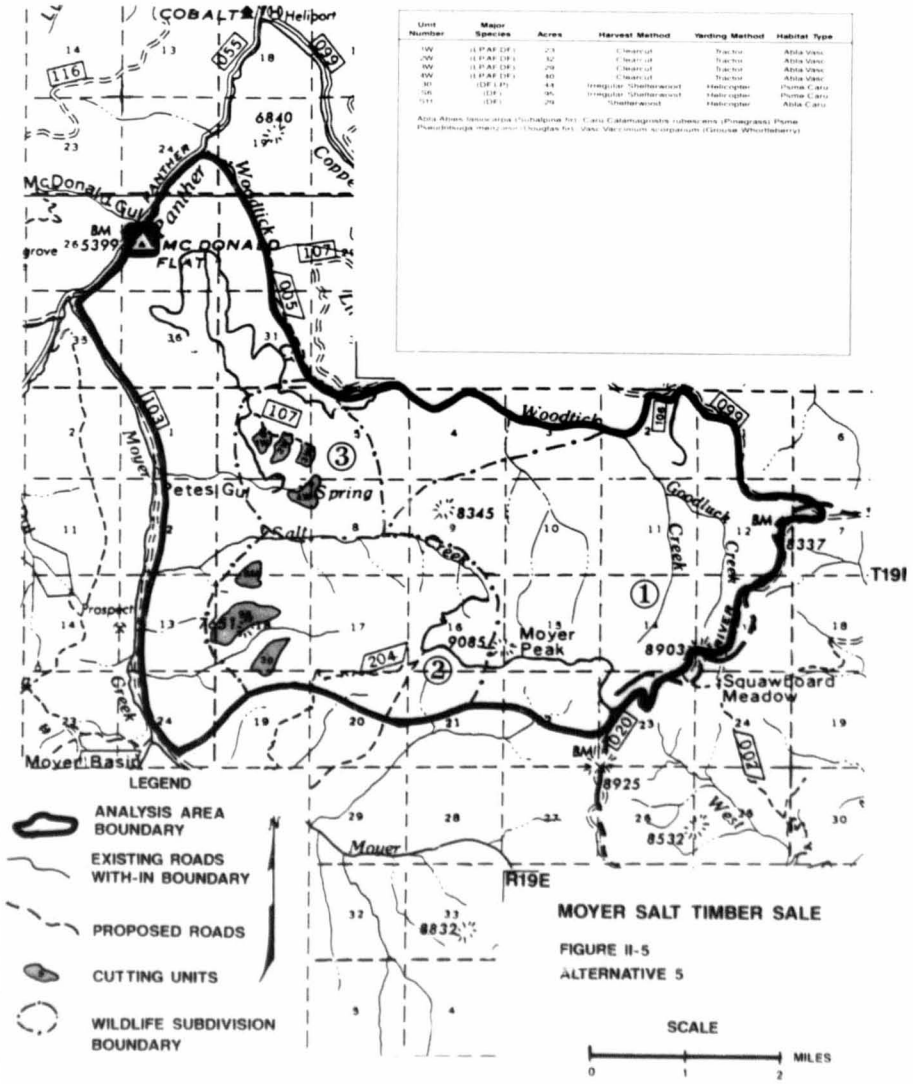
In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.



Unit Number	Major Species	Acres	Harvest Method	Yarding Method	Habitat Type
1W	(LP AF DF)	23	Clearcut	Tractor	Abla Vasc
2W	(LP AF DF)	32	Clearcut	Tractor	Abla Vasc
3W	(LP AF DF)	29	Clearcut	Tractor	Abla Vasc
4W	(LP AF DF)	40	Clearcut	Tractor	Abla Vasc
1F	(DF LP)	44	Irregular Shelterwood	Helicopter	Psme Caru
1S	(DF)	95	Irregular Shelterwood	Helicopter	Psme Caru
1H	(DF)	29	Shelterwood	Helicopter	Abla Caru

Abla Abies lasiocarpa (Subalpine fir); Caru Calamagrostis rubescens (Pinegrass); Psme Pseudotsuga menziesii (Douglas fir); Vasc Vaccinium scoparium (Grouse Whortleberry)

ALTERNATIVE 5

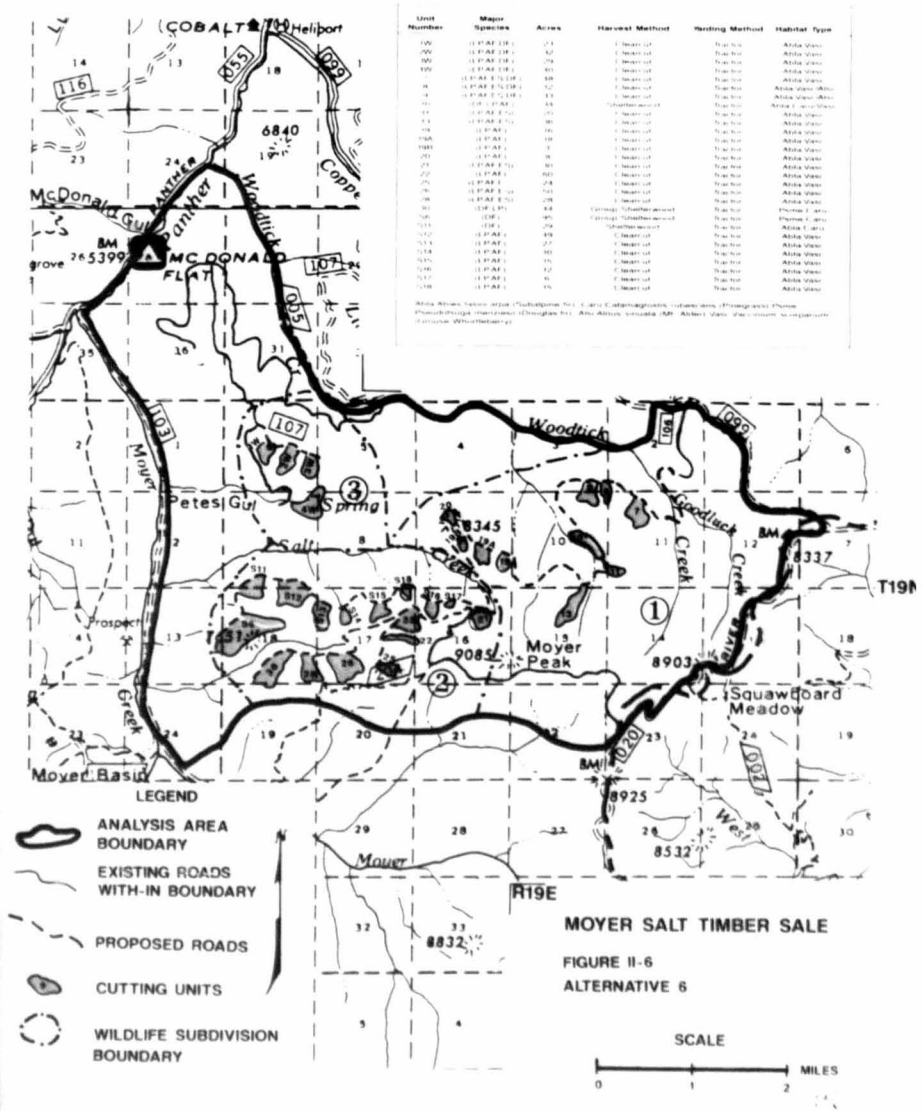
This alternative was developed in response to comments received on the DEIS. It is intended to respond to requests that "a no roads access for timber harvest" be considered and that an alternative be considered that "addresses harvesting less than 3.0 MMBF and constructing less than 10 miles of road.

This alternative contains 4 clearcuts and 3 shelterwood units totaling approximately 292 acres (Figure II-5). Access to the analysis area would be from existing F.S. Road 107. The existing roads would be reconstructed to Forest road specifications. Approximately 1.15 miles of new roads would be required to facilitate harvest. Units 1W, 2W, 3W and 4W would be tractor logged clearcuts while units S6, S11, and 30 would be helicopter logged utilizing the standard and irregular shelterwood silvicultural methods. Shelterwood harvest units contained in Alternatives 2, 3 and 4 include machine scarification and slash piling as part of the prescribed silvicultural system. These treatments would not be possible under this alternative due to lack of road access. The inability to perform machine scarification and slash piling will result in delayed regeneration periods and fuel loadings that may hinder big game movement (please refer to chapter IV - Environmental Consequences for a full disclosure of effects).

Total area that would be treated (acres)	292
Total volume that would be harvested (mmbf)	1.79
Miles of road	
Constructed:	1.15
Reconstructed:	8.0
Number of cutting units	
Douglas-fir	3
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	4
Clearcut Cutting Methods:	
Amount clearcut (acres)	124
Logging Methods:	
tractor (acres)	124
helicopter (acres)	0
Slash Disposal Method:	
piled and burned (acres)	124
broadcast burned (acres)	0
Machine Scarification (acres)	0
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	168
Logging Methods:	
tractor (acres)	0
helicopter (acres)	168
Slash Disposal Method:	
lop and scatter	168
broadcast burned	0
Machine Scarification (acres)	0

In addition to the mitigation measures common to all the action alternatives, the following mitigations apply:

1. The helicopter service landing will have an impermeable liner placed under the fuel storage area;
2. A physical barrier of sufficient height to contain any spilled hazardous substance will be placed around the helicopter service landing; and
3. Restrict fuel hauling for the helicopter to trucks without a trailer.


COBALT
Heliport
6840
McDonald Gulch
Panther
Woodtick
Copper
BM 8539
McDONALD FLAT
Moyer
Pete's Gulch
Spring
Salt
Creek
8345
Woodtick
Goodluck
Creek
BM 8337
T19N
Prospect
Moyer Peak
9085
8903
Squawboard Meadow
Moyer Basin
BM 8925
8532
Moyer
R19E
8832
LEGEND
ANALYSIS AREA BOUNDARY
EXISTING ROADS WITH-IN BOUNDARY
PROPOSED ROADS
CUTTING UNITS
WILDLIFE SUBDIVISION BOUNDARY
MOYER SALT TIMBER SALE
FIGURE II-6
ALTERNATIVE 6
SCALE
MILES
0
1
2

ALTERNATIVE 6 (PREFERRED)

This alternative was developed in order to provide a balance between concerns for visual quality and insect and disease conditions (Figure II-6). In the lodgepole community where clearcutting is proposed, Forest Plan standards and guidelines for visual quality would be achieved through a combination of unit size and leaving uncut islands (where slopes permit approximately 15% of the area within the clearcuts would be left in uncut islands ranging from 1/2 to 1 acre in size). Where necessary to meet visual quality objectives in the Douglas-fir community, timber stands would be harvested using an irregular shelterwood method. This method takes advantage of existing natural regeneration and in some cases will maintain four distinct age classes and canopy levels.

The island concept would be feasible in 16 of the 26 proposed clearcuts (units 1W, 2W, 3W, 4W, 13, 19, 19A, 19B, 20, 21, 22, 23, 25, 26, 28, S12). Leaving islands within units containing steep slopes and heavy fuel loadings (as in Alternative 2A) would not be attempted. Units 22 and 23 will leave approximately 30% of the area within the clearcuts in islands approximately 1 acre in size. The other units mentioned above will have approximately 15% of the area within the clearcuts in islands approximately 1 acre in size. As an example unit 22 (20 acres) would have approximately 6 islands designated (1 acre in size) thus the treated area would be reduced to 14 acres. Unit 1W (23 acres) would have approximately 3 islands designated (1 acre in size) thus the treated area would be reduced to approximately 20 acres.

The purpose of leaving the islands is five-fold:

1. Provide a regenerated stand that more closely approximates the species mix currently occupying the site;
2. To break up the units in order to provide a more visually pleasing setting when seen from a background or landscape view;
3. Provide big game bedding sites within the newly created forage area;
4. Break up site distances within the units to increase security and thus use by big game; and
5. Ensure protection of snags and retention trees that may otherwise be pushed over or damaged during the skidding and piling process.

Total area within harvest units (acres)	815
Total area that would be treated (acres)	747
Total volume that would be harvested (mmbf)	6.10
Miles of road	
Constructed:	17.8
Reconstructed:	9.3
Number of cutting units	
Douglas-fir	4
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	26

Clearcut Cutting Methods:	
Amount clearcut (acres)	545
Logging Methods:	
tractor (acres)	545
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	445
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Methods:	
Amount Shelterwood (acres)	202
Logging Methods:	
tractor (acres)	202
cable (acres)	0
Slash Disposal Method:	
piled and burned (acres)	*
broadcast burned (acres)	0
Machine Scarification (acres)	202

* Slash will be lopped, scattered and redistributed during the scarification process. Only concentrations may be burned.

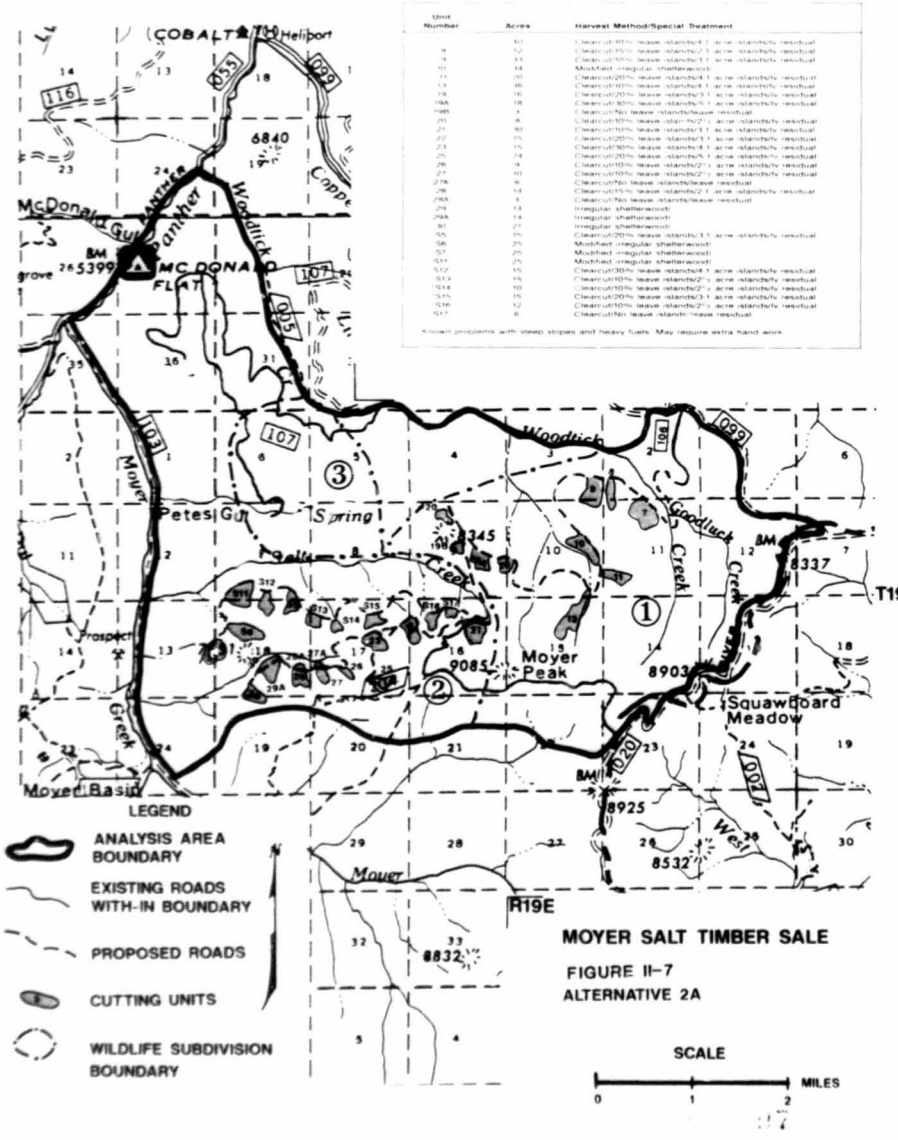
In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.



Unit Number	Acres	Harvest Method/Special Treatment
9	10	Clearcut/10% leave islands/4:1 acre islands/ly residual
9A	12	Clearcut/10% leave islands/2:1 acre islands/ly residual
9B	11	Clearcut/10% leave islands/3:1 acre islands/ly residual
10	18	Modified irregular shelterwood
11	20	Clearcut/20% leave islands/4:1 acre islands/ly residual
13	16	Clearcut/10% leave islands/4:1 acre islands/ly residual
19	18	Clearcut/20% leave islands/3:1 acre islands/ly residual
19A	18	Clearcut/30% leave islands/4:1 acre islands/ly residual
19B	1	Clearcut/No leave islands/leave residual
20	8	Clearcut/10% leave islands/2:1 acre islands/ly residual
21	10	Clearcut/10% leave islands/3:1 acre islands/ly residual
22	15	Clearcut/20% leave islands/3:1 acre islands/ly residual
23	15	Clearcut/30% leave islands/4:1 acre islands/ly residual
25	14	Clearcut/20% leave islands/4:1 acre islands/ly residual
26	9	Clearcut/10% leave islands/2:1 acre islands/ly residual
27	10	Clearcut/10% leave islands/2:1 acre islands/ly residual
27A	6	Clearcut/No leave islands/leave residual
28	14	Clearcut/15% leave islands/2:1 acre islands/ly residual
28A	4	Clearcut/No leave islands/leave residual
29	13	Irregular shelterwood
29A	14	Irregular shelterwood
30	21	Irregular shelterwood
505	15	Clearcut/20% leave islands/3:1 acre islands/ly residual
506	25	Modified irregular shelterwood
507	25	Modified irregular shelterwood
511	25	Modified irregular shelterwood
512	15	Clearcut/30% leave islands/4:1 acre islands/ly residual
513	15	Clearcut/10% leave islands/2:1 acre islands/ly residual
514	10	Clearcut/10% leave islands/2:1 acre islands/ly residual
515	15	Clearcut/20% leave islands/3:1 acre islands/ly residual
516	12	Clearcut/10% leave islands/2:1 acre islands/ly residual
517	6	Clearcut/No leave islands/leave residual

Known problems with steep slopes and heavy fuels. May require extra hand work.

ALTERNATIVE 2A

This alternative was developed to respond to concerns about visual quality. It is designed to mitigate the visual effects of timber harvest when viewed from a landscape or background view. All harvest units meet Forest Plan standards and guidelines for visual quality in terms of size. The unit sizes and locations are basically the same as Alternative 2 (Figure II-2A). However, where slopes permit, from 10% to 30% of the area within the clearcuts would be left in uncut islands ranging from approximately 1/2 to 1 acre in size. In addition, releasable residual understory trees that are free from disease will be left in all clearcuts. In the Douglas-fir community, timber stands would be harvested using an irregular shelterwood method. One key feature of this method is the delay of the removal cut until the average height of the regeneration is approximately 20 feet.

The island concept would be utilized in 24 of the 26 proposed clearcuts (units 27A and 28A are small cable where no islands would be left). As an example unit 19A (18 acres) would have 5 islands designated (approximately 1 acre in size) thus the treated area would be reduced to 14 acres, a reduction of approximately 30%. Unit 26 (9 acres) would have 2 islands designated (approximately 1/2 acre in size) thus the treated area would be reduced to approximately 8 acres, a reduction of approximately 10%. In units with heavy fuel loadings and steep slopes, some islands would be destroyed during the slash piling or burning processes. The degree to which the residual understory will be maintained will depend upon slope, fuel loading, and the condition of the understory.

The main purpose of the leaving the islands is to break up the units in order to provide a more visually pleasing setting when seen from a background or landscape view. However the islands do provide other benefits which include:

1. Provide a regenerated stand that more closely approximates the species mix currently occupying the site;
2. Provide big game bedding sites within the newly created forage area;
3. Break up site distances within the units to increase security and thus use by big game; and
4. Ensure protection of snags and retention trees that may otherwise be pushed over or damaged during the skidding and piling process.

Total area within harvest units (acres)	560
Total area that would be treated (acres)	502
Total volume that would be harvested (mmbf)	4.20
Miles of road	
Constructed:	16.8
Reconstructed:	1.3
Number of cutting units	
Douglas-fir	7
Lodgepole pine or mixed lodgepole pine, subalpine fir and Engelmann spruce	25

Clearcut Cutting Methods:	
Amount clearcut (acres)	344
Logging Methods:	
tractor (acres)	334
cable (acres)	10
Slash Disposal Method:	
piled and burned (acres)	244
broadcast burned (acres)	100
Machine Scarification (acres)	50-100
Shelterwood Cutting Method:	
Amount Shelterwood (acres)	158
Logging Methods:	
tractor (acres)	144
cable (acres)	14
Slash Disposal Method:	
piled and burned	*
broadcast burned	0
Machine Scarification (acres)	144

* - slash will lopped, scattered, and redistributed during the scarification process. Only concentrations may be burned.

In addition to the mitigation measures common to all the action alternatives, the following mitigation applies:

Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure.

Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high.

A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File.

For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet.

MANAGEMENT AND MITIGATION

Site-specific management and mitigation measures developed by the ID Team for each of the resources in the Moyer Salt and Salt Creek Timber Sale analysis area are listed in Table II-1. These measures were developed by applying various State and Federal standards and guidelines and Best Management Practices that govern how timber harvesting and road construction are implemented to the site-specific conditions that occur in the analysis area. The sources for the various regulations are given at the beginning of each resource section. For further information the reader is referred to the references given, in particular the Forest Plan (Chapter IV) and the Summary of Soil and Water Best Management Practices in Appendix B.

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES

SOILS: (Forest Plan)	1. All cut and fill slopes would be reseeded to grass and slopes would be left in a roughened condition to catch the seed and fertilizer and to minimize the loss off-slope. The seed mixture would include species adaptable to all soils types and aspects. 2. All native surfaced roads that would be closed behind gates would be harrowed, seeded to grass and fertilized as soon as possible after timber harvesting, except if graveled. 3. All disturbed sites, including cut and fill slopes, would be seeded in the fall of the year they are built. If roads are built during winter months, they would be seeded if there is less than 1 to 2 feet of snow on the ground. 4. At the end of the second growing season, an established grass stand should be present on the reseeded areas or efforts would be taken to reseed. A minimum average of 40 percent vegetative cover, including plant basal area and litter, constitutes an established grass stand. 5. All proposed waterbars and dips on temporary roads and/or skid trails would be constructed before the ground freezes. Spacing requirements outlined in the Forest Plan would be followed. 6. Waterbars would be installed on all skid trails immediately after harvesting a unit and before moving on to the next timber harvest unit. 7. All constructed landing sites would be ripped, reseeded to grass and fertilized. 8. All timber harvest units will be field checked before burning to determine the estimated fuel load present (in tons/acre) and to determine how much must be burned in order to yield 10 to 15 tons/acre of residual material.

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

Soils, continued	9. All timber harvest units that are machine piled and burned will have the burned and unburned material redistributed evenly over the unit after burning. 10. Total site productivity will be protected and/or maintained at a level equal to or greater than 90 percent of natural (reference Forest Plan IV-59). 11. A minimum of 80 percent of an activity area will remain in a non-detrimentally disturbed condition. (reference Forest Plan IV-59). 12. Total or essentially total soil resource commitment (in areas such as roads and log landings) will not exceed 5 percent of the analysis area. 13. Some boles will be left on site to serve as natural sediment catches on disturbed slopes. 14. A designated skid trail would be utilized in harvest units 7, 8 and 9, located in the Woodtick Creek area, to minimize soil resource damage. 15. Soil productivity would be maintained in each harvest unit by retaining 10 to 15 tons/acre of slash, including large woody debris (greater than 3 inches diameter) as microbial host material and smaller woody debris for nutrient reservoirs. 16. Broadcast burning would be performed in such a way that 10 to 15 tons of large woody debris and one inch of the O (organic matter) Horizon remain after burning. 17. Brush blade will be used for clearing slash off roads and landings during operation to keep slash piles free of soil.
HYDROLOGY:	1. The requirements for stream protection zones (IFPA) and filter strips (Best Management Practices in the Idaho Forestry Practices Act, Forest Plan, and Forest Service Manual; see Appendix B) would be closely followed to prevent adverse impacts to water quality 2. Road construction and timber harvest activities would be conducted according to the "Performance Criteria to be Observed to Protect Stream Channels" (Forest Service Manual 2505.1--2) as specified in the Memorandum of Understanding with the Idaho Dept. of Water Resources. 3. The Soil and Water Best Management Practices specified in the Forest Plan and in the Idaho Forestry Practices Act will be followed (See Appendix B: Summary of BMP's). 4. All temporary roads will be constructed, used, physically closed, and reseeded to grass before the ground freezes in the fall. Roads that will be left open over the winter will be designed specified roads and will have adequate drainage structures installed to prevent resource damage.

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

Hydrology, (cont.)	5. All areas disturbed by road construction will be seeded in the fall of the year they are disturbed, as specified in the engineering contract specifications. 6. Tractor units with slopes greater than 45 percent would be appraised for hand construction of waterbars to ensure that effective waterbars are placed on the steeper slopes. The contractor may use a machine to construct the waterbars but must finish them by hand if they are driven over after their construction. 7. Reseed all disturbed skid trails to grass after the construction of waterbars to ensure soil stabilization and minimize the invasion of noxious weeds. 8. Where specified, machine scarification for site preparation would be limited to alternating strips run on the contour. No machine scarification would be done within the stream protection zone or filter strips. 9. To prevent sediment movement downslope, slash windrows would be placed along the toe of the fill slope on all new roads. Continuous windrows would extend out from the stream crossing until an adequate filter strip exists between the toe of the fill and the stream. Outside the filter strip, short segments of the windrow will be removed at regular intervals for wildlife movement. 10. Reseed to grass and recontour all temporary roads not planned for salvage operations.
WETLANDS	1. The limits of the wet areas along the lower boundary of Units 25 and S14 will be flagged so that surface disturbance within these wetland areas would be avoided.
FISHERIES: (Forest Plan)	1. Appropriate crossing structures would be installed in all Woodtick Creek, Goodluck Creek and Salt Creek (Alternative 3 only) crossings to maintain fish passage opportunities. 2. The current obstacle to fish passage at the intersection of Woodtick Creek and Road 107, located in section 32, T20N, R19E, would be corrected in conjunction with prescribed road reconstruction operations under Alternative 3, 4, 5, and 6, or for Alternatives 2 and 2A, would be corrected by listing the fish passage rehabilitation projects as a priority on the Timber sale Improvement Plan (KV Plan).

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

Fisheries, (cont.)	3. Filter strips at least 200 feet wide would be maintained between Woodtick Creek and all adjacent land disturbance activities, excluding required stream crossing locations. Uncut filter strips at least 75 feet wide would be maintained between all other perennial streams and adjacent land disturbance activities, excluding required stream crossing locations. Site-specific consistency with Forest Plan filter strip width criteria would be maintained when prescribed minimums exceed 75 feet due to slopes, ground cover and soil type constraints. 4. An aquatic stream survey (for the purpose of baseline monitoring) and a Timber Sale Improvement Plan (KV Plan) addressing fish habitat improvement opportunities would be developed for the drainage segments within the timber sale area boundaries.
VEGETATION: (Forest Plan, Noxious Weed Environmental Assessment)	1. All disturbed areas (road cut and fill slopes and landing areas) would be treated for noxious weeds. 2. All timber harvest activities will follow the Best Management Practices (Summarized in Appendix B) and the Standards and Guidelines for timber harvest in the Forest Plan. 3. Sanitize (remove) dwarf mistletoe infected overstory trees on the edges of islands within two years of logging (Alternatives 6 and 2A)
WILDLIFE: (Forest Plan; Snag Amendment to the Forest Plan; Central Idaho Elk Guidelines)	1. Retain a minimum of one snag at least 20" diameter breast height (DBH), six snags at least 12" DBH and three snags at least 10" DBH on each ten acres of harvest unit in the Douglas-fir and spruce fir communities. Retain three snags at least 12" DBH and five snags at least 10" DBH on each ten acres of harvest unit in the lodgepole pine and subalpine fir communities. Retain a minimum of one replacement (green) tree at least 20" DBH and three trees at least 12" DBH per acre in the Douglas-fir and spruce fir units, and one tree at least 12" DBH and three trees at least 10" DBH in the lodgepole pine and subalpine fir units. 2. Retain a minimum of 50 ft. of 12" minimum diameter (large end) down and dead logs per acre in the Douglas-fir and spruce fir units, and a minimum of 33 ft of 10" minimum diameter (large end) down and dead logs per acre in the lodgepole pine and subalpine fir units.

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

Wildlife, (cont.)	3. Preserve the integrity of at least 75 percent of the linear distance of the natural forest/nonforest ecotones by providing at least a 100 foot uncut buffer between the ecotone and the unit. In shelterwood units marking would be phased in from the unit border. An uncut buffer of two sight distances or greater would be retained along all forest/nonforest ecotones within the key elk summer range (KESR) (see Chapter III, Figure III-2). 4. Restrict timber harvest and other human disturbance in a buffer zone around raptor nests to times when the nests are not being used. The size of the buffer would be species specific per Forest Plan direction and the time of use would be site specific. 5. Three subdivisions would be created in order to provide suitable displacement areas for big game (Figure II-4). Logging and/or road building activities would not occur simultaneously within these subdivisions. No logging, road building, or hauling would occur in Subdivision #2 that encompasses the Salt Creek area during big game hunting season. No logging, road building or hauling would occur in Subdivision #3 during the winter critical period from December 1 through May 15. 6. The depth of slash in units within the mapped KESR would not be greater than 1.5 ft. 7. Gate and close all specified roads upon completion of road construction. The roads would remain closed except during active periods of the sale or when needed for post-sale activities, administrative purposes, or periodic firewood gathering. 8. The spur road just west of Moyer Peak, in the SE1/4 NW1/4 of Section 16, will be closed by creating an earthen barrier that prevents vehicular access. 9. Slash will be placed from right-of-way windrow back on road prism to form "jackpot" type piles with a minimum diameter of 25 feet and an average height of 4 to 6 feet after completion of timber removal and during slash disposal. The timber sale contract will contain provisions for this procedure. Piles will be placed at 100 to 200 foot (avg. of 150 foot) intervals, will extend from cutslope to fill slope, and will be of sufficient magnitude and continuity to discourage all travel on the road prism by humans on foot and/or horseback. Openings created in the windrows by construction of these piles will serve as big game travelways and should not have residual slash in excess of 18 inches high. A map showing the roads (last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288) where slash piling will occur is contained in the Project File. For water quality protection, windrows will not be disturbed where the distance from the toe of the fill slope to live water is less than 200 feet. (This mitigation measure applies to all action alternatives **except** alternative 5. It is included in the description for alternatives 2, 3, 4, 6, and 2A.)

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

THREATENED, ENDANGERED AND SENSITIVE SPECIES: (Forest Plan)	1. If any listed or proposed Threatened, Endangered or listed Sensitive Species of animals, fish or plants are encountered during the proposed activities, the Forest Biologist would be notified and specific mitigation measures would be developed. 2. The Timber Sale Contract shall include contract clause C6.25#, which contains provisions for protection of habitat for Threatened and Endangered Species.
VISUAL: (Forest Plan)	1. Where slopes permit, irregular edges would be used for all harvest unit boundaries.
AIR QUALITY: (Forest Plan, Clean Air Act)	1. Burn piles would not be allowed to burn and smolder over a long period of time. 2. The burn pattern may be staggered in order to minimize air quality impacts to the area, depending on the burn method. 3. A Timber Sale Burn Plan would be developed for the proposed sale that considers wind direction and cumulative smoke impacts. 4. Burning will not be allowed below a wind speed of 2 miles per hour. Wind speed minimum will be 2 mph and up to 10 mph, only under good, excellent, or fair dispersion days, depending on local weather conditions at the time of burning and moisture content of the fuels. 5. The Swan Peak Road and the Ridge Road may be closed to the public during the day of burning, depending on local weather conditions at time of burning. 6. Dust control of the logging roads during construction and timber harvesting will be controlled by the addition of water or other material when required by the Engineer COR or the timber sale administrator. 7. If a timber harvest operation that utilizes the pile and burn method of slash burning generates more than 22 slash piles, burning will be split into two or more burn days. No more than 22 piles will be burned in a day; burn days must be excellent dispersion days with wind speeds between 2 and 10 miles per hour. 8. All piles will be free of soil to reduce smoldering when burned.

TABLE II-1: MANAGEMENT AND MITIGATION MEASURES SPECIFIC TO ALL ACTION ALTERNATIVES: continued

RANGE MANAGEMENT: (Forest Plan)	1. Cattleguards or gates would be used where newly-constructed roads cross range management fences. 2. Cattleguards would be used on existing roads used for timber sale activities.
CULTURAL RESOURCES: (Forest Plan)	1. If archeological sites are encountered during this proposed activity, the Cultural Resources specialist would be notified and specific mitigation measures would be developed. 2. State Historical Preservation Society (SHPO) clearance and approval of all requirements in Section 106 of the National Historic Preservation Act would be obtained before any ground-disturbing activities begin. 3. The Timber Sale Contract shall contain contract clause C6.24#, which provides for the protection of cultural resources and allows the Forest Service to modify or cancel the timber sale contract to protect cultural resources.

MONITORING

FOREST PLAN MONITORING

The Salmon National Forest has developed a plan to monitor and evaluate implementation of the Forest Plan, monitor the effectiveness of management practices implemented under the Forest Plan, and validate the assumptions and models used in planning (Forest Plan, V-2-19). This would provide the land manager with information on progress toward achieving the goals, objectives, and standards of the Forest Plan. Forest Plan monitoring done for the Salmon National Forest to address issues pertinent to the analysis area include:

1. If prescriptions for management areas are applied as prescribed;
2. If standards and management guidelines are being followed;
3. If objectives of the Plan are being achieved;
4. If applications of prescriptions for management areas are responding to public issues, management concerns, and management opportunities;
5. If effects of Plan implementation are occurring as predicted;
6. If costs of Plan implementation are as predicted;
7. If management practices on non-Forest lands adjacent to and within the Forest's boundaries are affecting the goals and objectives of the Plan; and
8. Effects of Plan implementation on other land and resource management agencies and organizations.

A monitoring program is prepared as part of the Forests' annual work program that details the amount and location of monitoring to be accomplished. Not all activities on the Forest are monitored on an annual basis, and not all of the Forest Plan monitoring requirements listed below are performed. Results of the monitoring program are presented in an annual Forest Plan Monitoring and Evaluation Report.

The Forest Plan monitoring requirements for soils, water and water quality, fisheries, vegetation (timber, including insects and disease), wildlife, Threatened and Endangered Species, visual resources, cultural resources, economics and other Forest resources are contained in Chapter V of the Forest Plan and are summarized below.

Soils: Monitoring of Forest soils is done through the following methods:

Unstable areas caused by natural conditions and off-road vehicle damage are monitored annually through aerial surveys.

Soils that are representative of large areas of the Forest are characterized using standard Soil Conservation Survey methods.

Erosion that results from various forest practices is quantified and compared.

Soil productivity is monitored to determine whether land management practices used on the Forest are adequate to meet the long-term soil productivity standards and guidelines specified in the Forest Plan.

Water and Water Quality: In order to achieve water quality protection, the Forest would monitor the following aspects of water quality and fish habitat protection:

Changes in water quality, in stream channel stability, in riparian areas, and the extent of stream channel deposition due to land management activities, both on a baseline and project scale.

Flow increases due to timber harvesting.

Comparisons of erosion on inslope versus outslope roads; cut slopes versus fill slopes; road treads; and on trails.

Fisheries: Fisheries monitoring includes the following:

Anadromous and resident fish populations and habitat quantity and quality are monitored through computer modeling (using the GAWS program), fish counts, habitat surveys, angler use surveys, etc.

Timber: The Forest Plan timber monitoring guidelines are designed to track implementation of the timber management program and include:

Tracking of regeneration status on harvested lands to determine if restocking is complete in five years;

Determining if openings created by even-aged management exceed maximum size established in wildlife standards and guidelines;

Review the five year timber action plan and monitor actual volume sold to determine that sales are progressing, annual volume is being offered, and sale volume will not exceed the 10-year allowable sale quantity.

Insect and disease infestation levels are monitored through annual aerial surveys.

The effectiveness of dwarf mistletoe or other suppression projects designed to protect regeneration are monitored through field review.

Wildlife: Wildlife monitoring includes the following:

Management Indicator Species populations and habitat trends, particularly those of big game animals, are determined through aerial surveys, hunter success rates and other data from the Idaho Department of Fish and Wildlife check stations, visual counts of animals, range inventory data, etc.

Habitat improvement is documented in the annual Wildlife Report.

Old-growth retention stands are monitored annually.

Threatened and Endangered Species:

Observation records are maintained and all sightings of Threatened and Endangered Species are investigated, except for species covered by other surveys.

Cultural Resources:

Field monitoring of known cultural sites is performed to determine the extent of natural deterioration or vandalism, on a biannual basis for easily accessed sites and every five years for isolated sites.

Economics:

An annual report is published that monitors capital investments, returns to U.S. Treasury, receipt shares to counties, and unit costs for planning activities.

PROJECT MONITORING

Project-specific monitoring for some resources would be conducted on the proposed timber sale during timber harvest and road construction to ensure that implementation is consistent with the established standards and guidelines, specifically those outlined in the timber sale contract. Monitoring is also conducted to determine the effectiveness of management activities and applied mitigation measures developed for the Moyer Salt Timber Sale (see Table II-1).

Each year the Forest selects three timber sales for post-sale review and inclusion in the annual monitoring plan. The timber sale ID Team, including specialists in wildlife, timber, hydrology and soils, performs a field review of the sales. The goal of these reviews is to determine if the standards and guidelines of the Forest are being met for each resource. Written reports of the review are included in the Forest Service files and a copy is sent to the State of Idaho Water Quality Bureau discussing findings and any corrective actions to be taken if necessary.

Most of the site-specific mitigation measures designed for the proposed Moyer Salt Timber Sale that are described in Table II-1 are incorporated into the contract drawn up between the timber sale pur-

chaser and the Forest Service. A Forest Service timber sale administrator is assigned to each sale to determine that the contractual provisions are met. Mitigation measures not included in the contract are the responsibility of the Forest Service.

Much of the post-sale monitoring that occurs on a timber sale is informal in nature. For example, when a member of the timber staff is performing post-sale regeneration field checks and notices that there are problems with road erosion, they would notify the appropriate resource specialist.

Specific monitoring developed for this project include:

Soils: Project level activities are monitored forest-wide for changes to soil productivity.

The Moyer Salt Timber Sale would be monitored during implementation to assure that Soil and Water Conservation Practices (SWCP) outlined in Forest Service Soil and Water Conservation Practices Handbook (FSH 2509.22) are implemented.

During project implementation, the timber sale administrator will also monitor soil disturbance associated with scarification and soil displacement that results from slash piling to ensure that Forest Plan standards are not exceeded.

The reseeded cut and fill slopes and any other reseeded areas would be monitored to determine the effectiveness of the reseeding effort and if additional planting is required.

All timber harvest units that are burned will be field checked after burning to determine if 10 to 15 tons per acre of large woody debris (greater than 3.0 inches in diameter) is left on the ground as specified in soil mitigation #8 (Table II-1).

Water Quality and Fisheries: The timber sale administrator would monitor the implementation of applicable BMPs and mitigation measures (site-specific BMPs) contained in the timber sale contract to ensure that the proposed activities do not impact water quality and, consequently, the fisheries resource. In particular, BMPs that apply to skid trail and road rehabilitation would be closely monitored.

Beginning in 1992 the following data will be collected to document existing conditions in Woodtick Creek prior to road construction and timber harvesting activities:

1. Percent Depth Fines (Core Sampling)
2. Wolman Pebble Count
3. Maximum/Minimum Water Temperature
4. Macroinvertebrates

Percent fines and the Wolman Pebble Count were measured in 1992 on Woodtick Creek, immediately above the stream crossing on Road #107. These two parameters will be measured after the road construction is completed in about 1994, and then again after timber harvesting is completed in about 1996. Maximum/minimum water temperatures were measured biweekly in 1992 from May-October at the mouths of Woodtick Creek and Moyer Creek. Maximum/minimum water temperatures will be measured again in 1993 to complete the baseline database, and then again after timber harvesting is completed in about 1996. Macroinvertebrates were sampled three times in 1992 above the mouths of Woodtick Creek and Moyer Creek. Macroinvertebrate samples will be taken again in 1993 on both streams to complete the baseline database, and then again after timber harvesting is completed in about 1996. Based upon the results of the post sale monitoring, a decision will be made as to whether or not there is a need to continue the monitoring for a longer period of time.

Vegetation (Timber): Timber sale layout would be reviewed by the ID Team to determine compliance with standards and guidelines of the Forest Plan prior to sale award.

The timber sale administrator would visit each active harvest unit at a frequency necessary to assure compliance with the timber sale contract.

Contract changes or contract modifications would be enacted, when necessary, to meet standards and guidelines on the ground.

Stand exams would be performed the first, third, and fifth year after harvesting to determine certification of regeneration. These exams would also monitor species composition of the stands as well as their health and vigor.

Post-harvest treatment exams and timber stand improvements such as thinning, planting (where required), and other cultural treatments would be performed as required.

Air Quality: All prescribed burning will be monitored for smoke dispersion during the time of burning to ensure that the burn plan is followed and that SASEM model criteria and standards set by the Clean Air Act are met.

Wildlife: The Forest Road management coordinator would monitor the timing and effectiveness of road closures and maintain the road closures that were identified in the site-specific mitigation plan.

Transportation: The Cobalt district is funded annually for road maintenance, to be used in part to monitor the conditions of the specified roads constructed for the timber sale.

Cultural Resources: Any project monitoring that is required under Section 106 of the National Historic Preservation Act and as part of the State Historic Preservation Office (SHPO) project approval would be performed as required.

COMPARISON OF ALTERNATIVES

Table II-2 contains a summary of the effects of the alternatives on each of the resources discussed in Chapters III and IV. The measurement indices used to compare these effects are those identified in the discussion of the issues in this chapter. The reader is referred to Chapter IV for an in-depth discussion of the effects of the alternatives.

TABLE II-2: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
VEGETATION							
Vegetative Diversity:							
Acres Harvested	0	568	440	847	292	747	502
Age distribution following harvest (in percent of analysis area)							
(0-39 yrs)	4.9	9.3	8.3	11.5	7.2	10.7	8.8
(40-79 yrs)	0	0	0	0	0	0	0
(80-119 yrs	11.7	11.7	11.7	11.7	11.7	11.7	11.7
(120-159 yrs)	69.9	66.1	67.1	64.3	68.3	64.9	66.6
(165+ yrs)	13.5	12.9	12.8	12.7	12.8	12.7	12.9
Change in species diversity in harvest units	None	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase	Moderate Increase
Timber Resource:							
Volume production in mmbf	0	4.9	3.75	6.9	1.79	6.1	4.2
mmbf deferred *	-6.1	-1.2	-2.25	0.8	-4.31	0 **	-1.1
Risk of infestation by insects and diseases	Moderate to High Increase	Strong Decrease	Moderate Decrease	Strong Decrease	Low Decrease	Strong Decrease	Low Decrease
Risk of infestation by noxious weeds	Very Low	Low	Low	Moderate	Very Low	Moderate	Low

* The amounts given here represent the difference between the largest Forest Plan consistent mmbf alternative offered (Alternative 6) and the other alternatives. These volumes display the mmbf that would be deferred from this offer during this planning period.

** Alternative 6 represents the largest mmbf sale quantity off that meets the Forest Plan Standards and Guidelines for all resources.

Harvest Method:							
Clearcuts with islands	0	0	0	0	0	427	402
Clearcut Acres	0	410	270	645	124	186	10
Shelterwood Acres	0	158	170	202	168	202	158

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
WILDLIFE							
Elk and Deer:							
* Elk Habitat Potential (EHP) (Percent of potential)							
Area I	67%	51%	51%	48%	59%	51%	53%
Area II	87%	90%	88%	92%	88%	90%	89%
Open Road Density: (Miles road per square mile)							
Area I	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Area II	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Total Road Density: (Miles road per square mile)							
Area I	0.14	1.46	2.25	1.0	0.14	1.0	1.28
Area II	0.56	2.5	1.5	2.9	0.72	2.7	2.42
Cover to Forage Ratio:							
Area I	32:68	27:73	27:73	26:74	29.71	27.73	28.72
Area II	80:20	72:28	75:25	68:32	77.23	69.31	73.27
** Elk Habitat Security:							
Area I	High	Low	Moderate	Very Low	Moderate	Low	Low
Area II	Very High	High	High	High	Very High	High	High
*** Elk Vulnerability:							
Area I	Moderate	Very High	High	Very High	High	Very High	Very High
Area II	Very Low	Moderate	Low	Moderate	Low	Moderate	Moderate
**** Old-growth Dependent Species:							
Acres of Timber Stands with Old Growth Characteristics Remaining:							
Area I	1750	1500	1520	1430	1625	1475	1540
Area II	3550	3200	3250	3025	3310	3040	3250
Percent Loss of Timber Stands with Old Growth Characteristics:							
Area I	0%	15%	13%	18%	7%	16%	12%
Area II	0%	10%	8%	15%	5%	14%	8%
Acres of Forest Plan Designated Old-Growth Retention Stands Cut:							
Area I	0	0	0	0	0	0	0
Area II	0	0	0	0	0	0	0

* Elk Habitat Potential (EHP) is the indicator for effects to elk and deer and is derived from the cover to forage ratio and the miles of road per square mile.

** Elk Habitat Security is 30% of an area occupied by cover blocks of 250 acres located 1/2 mile from open roads.

*** Elk Vulnerability reflects ease of human access and susceptibility of hunted elk.

**** The acres and percent loss of timber stands with old growth characteristics and old-growth retention stands are the indicators for effects to goshawk, pine marten and other old-growth dependent species.

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
ROADLESS AREA:							
Acres of Roadless Area Affected	0	9920	9920	9920	208	9920	9920
Percent of Taylor Mtn. Roadless Area Affected	0	16%	16%	16%	<1%	16%	16%
Acres of Roadless Area Remaining	63,220	53,300	53,300	53,300	63,012	53,300	53,300
Wilderness Eligibility Of Roadless Area Maintained	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Effects to Roadless Characteristics:							
Natural Integrity	None	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease
Apparent Naturalness	None	Decrease	Decrease	Decrease	Decrease	Decrease	Decrease
Primitive Recreation	None	None	None	None	None	None	None
Solitude	None	Decrease	Decrease	Decrease	None	Decrease	Decrease
Special Features	None	None	None	None	None	None	None
Special Places and Activities	None	None	None	None	None	None	None
ECONOMIC EFFICIENCY							
Present Net Value							
Long Term Average	0	-$210,077	-$161,329	-$300,679	*	-$277,853	-$183,069
Present Trend	0	+$253,925	+$303,502	+$295,651	-$94,936	+$303,626	+$262,241
Gross Stumpage Income							
Long Term Average	0	+$400,670	+$306,186	+$564,444	+$69,315	+$498,801	+$343,235
Present Trend	0	+$569,100	+$525,300	+754,200		+$706,200	+$527,100
Road Costs							
Construction	0	+$372,150	+$383,850	+$411,150	+$42,000	+$411,150	+372,150
Road Costs/mbf	0	+76	+$102	+$60	+$26	+$67	+$89

The economic efficiency of the alternatives can be compared by calculating the present net value and gross income of each alternative. These were calculated based on the long term average prices and with present prices to reflect the recent increases in the value of timber.
* No value was calculated because this alternative was not economically viable (it would not sell) with the long term stumpage values.

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
SOILS							
Existing Roads	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.	16.6 mi. 57 ac.
New Roads	0 0	16.8 mi. 62.1 ac.	14.6 mi. 55.2 ac.	17.8 mi. 66.1 ac.	1.1 mi. 4.0 ac.	17.8 mi. 66.1 ac.	16.8 mi. 62.1 ac.
Acres of Total Soil Resource Commitment	57 ac.	119 ac.	111 ac.	123 ac.	61 ac.	123 ac.	119 ac.
Percent of Analysis Area with Total Soil Resource Commitment *	0.4%	0.8%	0.7%	0.8%	0.4%	0.8%	0.8%

* Total soil resource commitment occurs when the soil is committed to a use other than growing vegetation for an extended period of time; this typically occurs in roads, landing areas, and some skid trails.

HYDROLOGY

Effects to Water Yield:

Percent of Drainages Harvested*:							
Woodtick Creek	5.2%	7.3%	7.0%	8.2%	6.0%	7.9%	7.1%
Salt Creek	0%	9.1%	4.5%	14.3%	5.1%	12.3%	8.2%
"Perm" Creek	0%	11.3%	11.3%	14.2%	4.3%	13.1%	10.4%
Predicted Changes to Water Yield	None	No Major Effect	No Major Effect	No Major Effect	Minimal	No Major Effect	No Major Effect
Beneficial Water Uses Maintained	Yes	Yes	** No	Yes	Yes	Yes	Yes
State Water Quality Standards Met	Yes	Yes	** No	Yes	Yes	Yes	Yes

* Research has shown that harvesting more than 20 percent of a drainage can result in detectable increases in peak flow due to loss of vegetation.
** Beneficial water uses would be maintained and state water quality standards would be met in Woodtick Creek and Moyer Creek. Adverse water quality impacts are anticipated in Salt Creek only.

WETLANDS

Acres of Wetlands Affected	None	* <3	* <2	* <3	None	* <3	* <3

* These acres of affected wetlands are primarily at stream crossings.

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
FISHERIES							
Anadromous and Resident Fish Habitat Maintained	* Yes	Yes	** No	Yes	Yes	Yes	Yes

* The culvert that is currently obstructing fish passage where F.S. Road 107 crosses Woodtick Creek will be corrected through KV funding with Alternatives 2, 3, 4, 5, 6, and 2A, but is not scheduled to be corrected under Alternative 1, the No Action Alternative. Habitat would be maintained but not improved under this alternative.

** Anadromous and resident fish habitat would not be maintained in the Salt Creek drainage, and habitat within the mainstem Moyer Creek streamcourse below the mouth of Salt Creek would additionally be at high risk of being adversely impacted. Habitat would be maintained within the Woodtick Creek, Goodluck Creek, and "Perm" Creek drainages under this alternative, however.

THREATENED, ENDANGERED AND SENSITIVE FISH SPECIES **(The final biological assessment of effects to T & E fish species is being documented within the Salmon National Forest's Proposed Activity Review for the Panther Creek Watershed. Concurrence from the National Marine Fisheries Service is unknown at this time).**							
Effects to Listed Fish T & E Species and Their Habitat	No Effect	Not LTAA*	LTAA*	Not LTAA*	Not LTAA*	Not LTAA*	Not LTAA*
Effects to Potential Fish T & E Habitat	No Change from Existing Condition	Improvement in Woodtick Creek	Improvement in Woodtick Creek Degradation in Salt and Moyer Creeks	Improvement in Woodtick Creek	Improvement in Woodtick Crseek	Improvement in Woodtick Creek	Improvement in Woodtick Creek
Effects to Region 4 Sensitive Fish Species and Their Habitat	No Effect	*Not LTAA	*LTAA Steelhead and Bull Trout	*Not LTAA	*NOT LTAA	*Not LTAA	*Not LTAA

* LTAA - Likely to Adversely Affect

THREATENED, ENDANGERED AND SENSITIVE VERTEBRATE SPECIES							
Effects to Gray Wolf						Not LTAA	

* LTAA - Likely to Adversely Affect

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
VISUAL RESOURCES							
Number of Units Where Visual Quality Objectives Are Not Met	0	0	0	5	0	0	0
RECREATION							
Acres Converted from Semi-Primitive Motorized & Nonmotorized to Roaded Natural Appearing	0	6,990	6,310	6,990	0	6,990	6,990
AIR QUALITY							
State and National Air Quality Standards Met	Yes	Yes	Yes	Yes	Yes	Yes	Yes
TRANSPORTATION AND ACCESS							
Acres available for timber harvesting with existing road system	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Acres available for timber harvesting with proposed road system	0	2,807	1,824	2,957	150	2,957	2,807
Miles of Road Constructed	0	16.8	14.6	17.8	1.1	17.8	16.8
MINERALS							
Would interfere with potential mineral developn ent	No	No	No	No	No	No	No

TABLE II-2, continued: COMPARISON OF EFFECTS OF THE ALTERNATIVES BY RESOURCE

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
CULTURAL RESOURCES							
* Potential Impacts to Cultural Resources	None	Low	Low	Low	Low	Low	Low
RANGE RESOURCES							
Change in Range Resource	None	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement	Minor Improvement

* A cultural resources survey will be completed before any ground disturbing activities begin. Approximately 95% of the area was cleared by SHPO on 8/18/92. Clearance is expected by 8/1/93 on the remaining 5% of the area.

Chapter III

Affected Environment

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CHAPTER III

AFFECTED ENVIRONMENT

CHANGES BETWEEN THE DRAFT AND FINAL

1. Additional water quality data was collected and discussed in the Hydrology and Fisheries sections.
2. A breakdown of wetland acreage by type is included in the Wetland section.
3. The affected area and existing condition descriptions for biological diversity have been expanded. A map identifying the Moyer Salt landscape area and it's adjacent landscapes has been included.
4. An old growth retention area map has been included in the Final EIS.

CHAPTER REVIEW

This chapter describes the existing condition of the environment that would be affected by the action alternatives. It provides the baseline for comparison of the effects on the environment that are disclosed in Chapter IV. The existing environment of the area affected by the proposed action is described in detail in terms of specific resources and in the following order: soils, hydrology, fisheries, vegetation, wildlife, Threatened, Endangered and Sensitive Species, roadless area, visuals, recreation, range, transportation, minerals, cultural resources, air quality, and economic efficiency.

The Moyer Salt and Salt Creek Timber Sale is located about 22 miles southwest of Salmon, Idaho (see Figure I-1, Chapter I). The area of analysis lies between the Woodtick Creek drainage on the north, the Moyer Creek drainage on the west, Moyer Peak on the south, and the Salmon River Mountain Road (F. S. Road 020) on the east (Figure I-2, Chapter I).

Forest Plan Goals and Objectives

The Forest Plan has established goals and objectives that recognize and promote the intrinsic ecological and economic values of all resources in the Salmon National Forest. These goals will be forwarded in this context by direction in the specific resource areas. The goals for each resource area are briefly outlined at the beginning of each section below; for more information on Forest goals, the reader is referred to Chapter II of the Forest Plan.

SOILS

Forest Plan Goals and Objectives

The direction or goal for soils is to: maintain soil productivity, minimize man-caused soil erosion, and maintain the integrity of associated ecosystems; identify at the project level filter strip requirements adjacent to streams to reduce sediment delivery from roads and other major surface disturbance; maintain watershed conditions and water quality such that downstream beneficial uses are protected and compliance with Idaho State standards is achieved; and continue the ongoing Forest Soil Resource Inventory (in conjunction with the Soil Conservation Service and the University of Idaho).

Affected Area

The Moyer Salt and Salt Creek Timber Sale area is bounded by Woodtick Creek and Moyer Creek on the northeast and southwest, respectively, and by Panther Creek and Moyer Peak on the northwest and southeast, respectively (see Figure I-2, Chapter I). Elevations in the project area range from 5,500 feet at Panther Creek to 9,000 feet at Moyer Peak.

Existing Condition

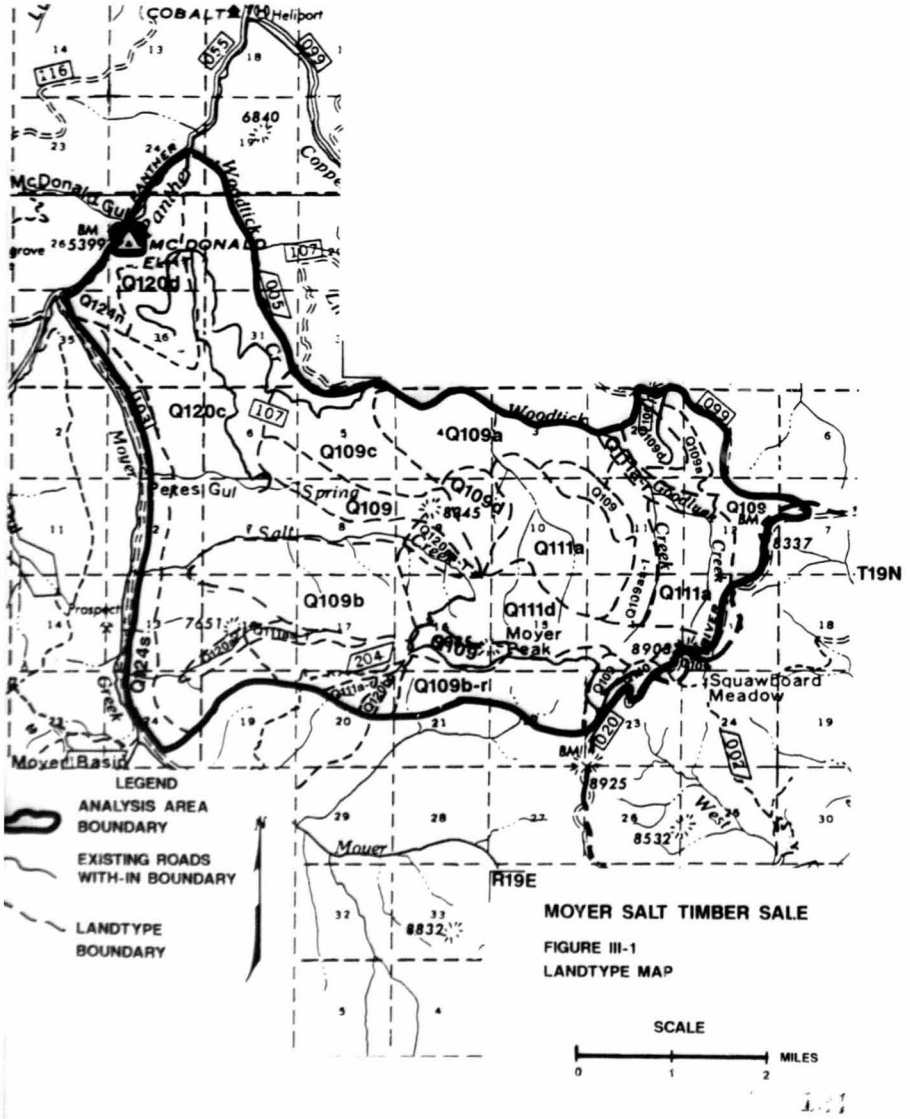
The landtypes of the analysis area were mapped during Order 3 Landtype Surveys performed in the 1970's and field updated in 1990 (Landtype survey, Project File). Landforms in the analysis area are formed from quartzite parent material; their distribution is shown on the landtype map (Figure III-1) (Salmon National Forest, 1978) and briefly described in Table III-1. A complete description of each landtype is located in Appendix C.

An Order 3 Soil Survey of the analysis area by a Salmon National Forest soil scientist was completed for the analysis area in 1981 (Soil Survey Report, Project File). Soil parent material has been mapped as quartzite but is actually phyllite, a type of metamorphosed quartzite (U.S.F.S., 1981). The rocks consist of light gray to greenish-gray laminated siltite, argillite, and thinly bedded, cross-laminated quartzite (Connor and Evans, 1986). The phyllite is foliated, moderately metamorphosed, finely textured, and produces soils that have a higher clay and silt content than soils formed from true quartzite parent material. The amount of clay in the rock varies throughout the sale area. In one area of high clay content, located in the south side of the ridge between Little Woodtick Creek and Woodtick Creek, the phyllite contains 25 to 30 percent clay.

Table III-1: Landtypes in the Moyer Salt Analysis Area*

Landtype Number	Description
III Q109	Cryic Ridgelands in Quartzite, Moist Sites
III Q109a	Cryic Ridgelands in Quartzite, Moist to Dry Sites
III Q109as-1	Weakly Dissected Cryic Mountain Slopes In Quartzite
III Q109b	Moderately Dissected Cryic Mountain Slopeland in Quartzite, Moist Sites
III Q109b-r	Moderately Dissected, Rocky, Cryic Mountain Slopeland in Quartzite
III Q109c	Strongly Dissected Cryic Mountain Slopeland in Quartzite, Moist Sites
III Q109d	Cryic Headlands in Quartzite, Moist to Wet Sites
III Q11Od	Steep Rocky Cirque Headwall in Quartzite
III Q111a	Weakly Dissected Glacial Troughlands in Quartzite, Moist Sites
III Q111as-1	Weakly Dissected Glacial Troughlands in Quartzite, Cold and Dry Sites
III Q111a-R	Rocky Weakly Dissected Glacial Troughlands in Quartzite, Cold and Dry Sites
III Q111d	Steep Glaciated Headlands in Quartzite (up to 20 percent rock outcrop)
III Q120a-R	Weakly Dissected, Rocky Mountain Slopeland in Quartzite
III Q120as-1	Weakly Dissected Mountain Slopelands in Quartzite, Warm and Dry Sites
III Q120bn	Moderately Dissected Mountain Slopelands in Quartzite, Cold and Moist Sites
III Q120c	Strongly Dissected Mountain Slopelands in Quartzite, Cool and Moist Sites
III Q120d	Steep Timbered Headlands,Moist to Wet Sites
III Q124n	Steep Timbered Canyonlands in Quartzite
III Q124s	Steep Canyonland in Quartzite, Hot and Dry Sites

* Source: Salmon Uplands Section Composite Book, Section III, Landtypes, Salmon National Forest, March, 1978.



Soils in the analysis area have been identified through soil mapping and are classified as: Typic Cryoborolls, sandy-skeletal, mixed (consists of a loamy topsoil over a sandy loam to loamy-sand subsoil); Typic Cryochrepts, loamy-skeletal, mixed and Argic Pachic Cryoborolls, loamy-skeletal mixed (consist of a loam topsoil over a sandy or clay loam or loam subsoil). Other possible soils found within the landtypes in the analysis area are: Typic Cryorthents, loamy-skeletal, mixed; Lithic Cryochrepts, loamy-skeletal, mixed; Typic Cryoborolls, loamy-skeletal, mixed; and Lithic Cryoborolls, loamy-skeletal, mixed (USDA - SCS, 1975).

Soil textures throughout the analysis area are generally loamy on the surface (Soil Survey, 1977 and 1981). Lower horizons range from loamy sands to clay loams, with loamy sands to sandy loams predominant. The upper 12 inches of the soil horizon typically consists of darkly colored soil, rich in organic matter, which grades with depth to a reddish-brown or light brown color in the lower horizons. Clay content in some subsoils ranges as high as 30 percent. A clay accumulation horizon (Bt1) commonly occurs between 20 and 40 inches depth, and the clay content below this horizon decreases. Coarse fragments (gravel, cobbles, and stones) are common throughout the soil profiles throughout the entire analysis area. Cobbles make up about 35 percent of the volume of the soil profiles that were inventoried during soil surveys performed in the area (Soil Survey, 1977 and 1981). Gravel content is highest in sandy soils with low clay contents and make up about 60 percent of the volume in the samples tested. The soils are generally deep throughout the analysis area, although rock outcrops, talus slopes, and shallow soils occur locally. One area of rock outcropping is located along Woodtick Creek where the proposed road (the extension of F.S. Road 106) crosses the creek.

Soils throughout the area are generally quite stable, although some areas of slight rilling were noted. This rilling is probably due to the higher sand and fine gravel content rather than clay content. The bedrock character of the project area, composed of laminated siltite, argillite, and cross-bedded quartzite, dictates a low natural sediment rate for the area.

Parameters of soil stability and erosion and mass wasting potential due to road construction or other management activities were estimated during the soil survey and are shown in Table III-2).

Table III-2: Soil Erosion and Mass Stability Characteristics in the Moyer Salt Timber Sale Analysis Area

Erosion Potential	Degree
Inherent Erosion Hazard	Low to moderate (high on steep slopes)
Debris slide potential	Very low to moderate
Slump hazard	Very low to low
Surface creep hazard	Very low to moderate
Potential to create sediment	Very low on gently sloping topography, moderate on steeper slopes
Mass stability (of cut and fill slopes)	Good; occasional failures may occur on steep slopes or where groundwater is encountered
Erosion potential (fill slopes)	Low, if revegetated
Erosion potential (cut slopes)	Moderate to high due to steepness of slopes, shallow soil, low moisture content, poor revegetation, and aspect.

HYDROLOGY

Forest Plan Goals and Objectives

The water management goal is to maintain watershed conditions and water quality such that downstream beneficial uses are protected and compliance with State standards is achieved.

Affected Area

The analysis area for hydrology is the Woodtick Creek and Moyer Creek drainages. Woodtick Creek and Moyer Creek are tributaries of Panther Creek. Salt Creek and "Perm" Creek are small perennial streams that are tributaries of Moyer Creek.

Existing Condition

The Moyer Creek drainage is approximately 39.2 mi² with an average annual flow of 19 cubic feet per second (cfs). The mean monthly flows in this stream vary from a low of 6 cfs during the fall-winter period to about 77 cfs during snowmelt. The headwaters of Moyer creek are in U-shaped, steep-sided glaciated valley bottoms. Based upon past watershed inventories the stream channel stability in upper Moyer Creek is generally good. About one mile above the South Fork of Moyer Creek the main Moyer Creek valley bottom opens up into a wider flat-floored valley. Two unnamed V-shaped, high gradient streams enter Moyer Creek in this reach. Downstream to about Salt Creek, Moyer Creek remains in a gentle gradient, flat-floored valley bottom. In general stream channel stability is good in this reach. Below Salt Creek to the confluence with Panther Creek, Moyer Creek is in a moderate gradient, steep sided, V-shaped valley bottom. Stream channel stability is generally fair to good in this reach. Three small parallel drainages enter Moyer Creek within the analysis area below Moyer basin. They include Salt Creek, Pete's Gulch, and "Perm" Creek. These drainages are in very high gradient, steep sided, V-shaped valley bottoms. Stream channel stability in these drainages is generally good.

The Woodtick Creek drainage is approximately 16 mi² with an average annual flow of 9 cfs. The mean monthly flows in this stream vary from a fall-winter low of 3 cfs to 36 cfs during snowmelt. The headwaters of Woodtick Creek are also in very high gradient, U-shaped valley bottoms. These valleys were formed by glaciation which resulted in some side walls being nearly vertical. Below the headwaters, the valley bottom is V-shaped and steep sided. Stream channel stability in this drainage is generally fair to good.

Panther Creek and its tributaries above Blackbird Creek have been designated by the State of Idaho as having the following Designated Water Uses: Domestic Water Supply, Agricultural Water Supply, Cold Water Biota, Salmonid Spawning, Primary Contact Recreation, and Secondary Contact Recreation. Currently none of the streams within the analysis area are used as a source of domestic water. The primary existing beneficial water uses are for cold water biota, salmonid spawning, and secondary contact recreation. The specific standards for these designated beneficial uses are spelled out in the Idaho Department of Health and Welfare, Water Quality Standards and Wastewater Treatment Requirements. In addition to the State Water Quality Standards, the Salmon National Forest Plan states that watershed condition and water quality will be maintained such that downstream beneficial water uses are protected.

Water quality data was collected on Moyer Creek and Woodtick Creek during 1992. The following parameters were evaluated; water temperature, carbon dioxide, hardness and alkalinity (as Calcium Carbonate), acidity, pH, dissolved oxygen, sulfate, phosphate, nitrate, and specific conductivity.

Maximum and minimum stream temperatures recorded at the mouth of Woodtick Creek between June and October, 1992 ranged from 36 to 61 degrees Fahrenheit. Maximum and minimum stream temperatures recorded at the mouth of Moyer Creek for the same period ranged from 32 to 54 degrees Fahrenheit. (See Fish Habitat and Water Quality, Chapter III).

Dissolved oxygen concentrations ranged from 9 to 11 milligrams/liter (mg/l same as parts per million) for both Woodtick and Moyer Creeks. These concentrations met the standards for Cold Water Biota and Salmonid Spawning specified in the State of Idaho Water Quality Standards (IDAPA 16.01.2000).

The pH values measured ranged from 7.5 to 8.0 for Woodtick Creek and 7.0 to 7.7 for Moyer Creek. These values are within the desired pH range of 6.5 to 9.0 for Cold Water Biota and Salmonid Spawning (IDAPA 16.01.2000).

Alkalinity as Calcium Carbonate was in the range of 35 to 105 mg/l on both streams, while carbonate hardness ranged between 30 and 70 mg/l. Alkalinities and hardness are consistent with other streams and rivers within the area.

The total phosphorus concentrations ranged from 0 to .16 mg/l on Moyer Creek and 0 to.2 mg/l on Woodtick Creek. The nitrate nitrogen concentrations were from 0 to .02 mg/l on Moyer Creek and Woodtick Creek. Sulfate concentrations ranged between 5.5 and 8.0 mg/l on both streams. The nitrogen and sulfate levels are well below the maximum concentrations for drinking water standards.

Sediment core sampling on Woodtick Creek in 1992 revealed a mean of 15% fines-by-depth at likely spawning sites. This value meets the Forest Plan objectives of less than 20% fine sediment for anadromous fish spawning habitat.

In 1988 the Tick Creek Timber Sale was harvested in the Woodtick Creek drainage. Twenty three units totalling 543 acres were harvested in this sale. Of this total, 12 units totalling 252 acres were cut in the drainage of Little Woodtick Creek, a small, intermittent stream that is a tributary of Woodtick Creek. This harvest acreage was 23 percent of the entire drainage. Post sale evaluation in the spring of 1991 showed stream sedimentation in Little Woodtick Creek in the low-gradient depositional areas of the channel. Further evaluation of the drainage showed that the deposited sediment came from stream bank and bed erosion. Surface erosion of the logging units and roads was not contributing to the sediment deposited in Little Woodtick Creek. The erosion appears to have been caused by increased snowmelt runoff as a result of harvesting a significant portion (23 percent) of the drainage. Though the area was harvested in 1988 the runoff in the spring of 1991 was the first "near normal" runoff since the drainage was harvested.

Streamflow measurements on numerous streams on the Forest in the spring of 1991 showed snowmelt runoff levels near or at normal. No bank erosion similar to that observed in Little Woodtick Creek was observed on other streams measured on the Forest.

Since Little Woodtick Creek is a small intermittent stream that does not support a fishery, the stream sedimentation observed should not adversely impact fisheries. Woodtick Creek, because of its greater flow, should be able to transport the sediment delivered by Little Woodtick. No significant stream sedimentation is anticipated in Woodtick Creek as a result of the channel erosion in Little Woodtick Creek.

WETLANDS

Forest Plan Goals and Objectives

The Forest Plan goals and objectives for riparian zones (that include riparian wetlands) specify that these zones shall be managed in a manner compatible with protection of water quality and fisheries habitat. Management of other wetland areas such as isolated wetlands and wet meadows is not specifically addressed in the Forest Plan, although the maintenance of all ecosystems and habitats on the Forest is mandated. Management of wetlands also falls under the jurisdiction of the Army Corp of Engineers under section 404 of the Clean Water Act, and several other Federal manuals and executive orders provide further direction.

Affected Area

Wetlands in the analysis area were identified within a corridor encompassing all the proposed roads and cutting units. Their identification was based upon field reviews of the proposed activities and aerial photo identification. A documentation of the Wetlands Analysis Methodology is found in the Project File.

Existing Condition

Several types of wetlands are found in the analysis area: 1) riparian stringer wetlands; 2) isolated wetlands derived from springs and seeps; and 3) wet meadows.

Riparian stringer wetlands: The predominate wetlands in the area are riparian wetlands. Approximately 30 miles of riparian stringer wetlands are located in the affected area. These wetlands have variable widths ranging from several feet to over one hundred feet. The predominant wetlands in the area are riparian spruce wetlands. These wetlands are found adjacent to Woodtick Creek and its tributaries. This wetland type is characterized by an Englemann spruce (*Picea engelmannii*) overstory. In

addition, aspen (*Populus tremuloides*), alder (*Alnus incana*) and/or (*A.sinuata*), and water birch (*Betula occidentalis*) may be present. The understory often includes red osier dogwood (*Cornus stolonifera*), Woods rose (*Rosa woodsii*), elderberry (*Sambucus canadensis*), gooseberry (*Ribes inerme*), and thimbleberry (*Rubus parviflora*).

Isolated Wetlands: Approximately 15 acres of isolated wetlands have been identified in the area. Because of the dense forest canopy in most of the area these wetland types are difficult to locate and the actual acreage probably exceeds the 15 acres identified by a significant amount. Several types of isolated wetlands derived from springs and seeps are found in the area. One type is characterized by an alder overstory. A low cover of huckleberry (*Vaccinium globulare*) is often present along with honeysuckle (*Lonicera involucrata*). Another isolated wetland type is characterized by willow (*Salix spp.*) with an understory of sedge (*Carex spp.*). Both of these isolated wetlands types may also have a scattered overstory of aspen. These types of wetlands are often used for elk wallows.

Wet Meadows: Several types of wet meadows are also found in the project area. Wet meadows are found at the head of an unnamed tributary to Woodtick Creek and at the headwaters of Salt Creek. Approximately 14 acres of wet meadow have been identified in the analysis area. The vegetation communities in these wetlands are dominated by sedge, marshmarigold (*Caltha leptosepala*), and smooth woodrush (*Luzula glabrata*).

Wet meadows are also found along the upper Salt Creek drainage. The predominate vegetation in this wetland type is willow with an herbaceous understory of sedge and Kentucky bluegrass (*Poa pratensis*).

The wetlands found within the project area are relatively common. The kinds of wetlands and vegetative communities associated with them are not restricted or unique to the area.

Past activites that have impacted existing wetlands are very limited in the project area. Road #107 crosses a riparian spruce wetland on Woodtick Creek and several other smaller stringer riparian wetlands. These existing stream crossings have not had any significant adverse impacts to wetlands. A jeep trail below Moyer Peak crosses a narrow riparian spruce wetland. There is no fill or culvert at this crossing, consequently the jeep trail is boggy in this location, though impacts to the wetland are minor.

FISHERIES

Forest Plan Goals and Objectives

The fisheries management goal is to maintain aquatic habitat capability at a level sufficient to meet state and federal water quality and species production goals for both resident and anadromous fisheries. Additionally, the Forest Plan states that wildlife habitat of sufficient quantitiy and quality shall be provided that will sustain target populations of economically important management indicator species and that will at least maintain minimum populations for all other management indicator species (all trout and anadromous fish are management indicator species).

Affected Streams

The proposed Moyer Salt Timber Sale analysis area encompasses portions of the Woodtick Creek and Moyer Creek watersheds. Within the Woodtick Creek drainage system proposed activities have the potential to impact mainstem Woodtick Creek and the lower reach of Goodluck Creek. Both streams are perennial and possess sufficient flow volume and aquatic habitat capability to support substantial fisheries resources. The analysis area also encompasses an unnamed, largely intermittent tributary stream which enters Woodtick Creek approximately 1.7 miles downstream of the mouth of Goodluck Creek (Township 19 N, Range 19 E, Section 3) (Figure II-1).

Within the Moyer Creek drainage the analysis area encompasses Salt Creek and an unnamed perennial stream locally known as "Perm" Creek, which joins Moyer Creek in Township 19 N, Range 18 E, Section 24. Salt Creek is of sufficient size to provide supplemental spawning and/or rearing habitat to fisheries resources in the Moyer Creek drainage and may support a minor resident population through its mid reaches. The smaller "Perm" Creek provides only marginal spawning or rearing capabilities in its lowermost reach. Specific alternatives also encompass portions of the Pete's Gulch drainage, which is not believed to support fish life.

Resident Fisheries

The mainstem reaches of Woodtick Creek and Moyer Creek both support well-established populations of resident salmonids. Bull trout (Dolly Varden), a Forest Service Intermountain Region Vertebrate Sensitive Species (VSS) and Idaho Department of Fish and Game Species of Special Concern (SSC), are known to be present in both streams, along with resident populations of rainbow trout (Buram et al, 1990). Mountain whitefish additionally utilize mainstem habitats within Moyer Creek (Species List, Appendix D). 'daho Department of Fish and Game management prescriptions for the two streams calls for a "wild trout" resident fishery supported by natural production (Idaho Department of Fish and Game, 1991).

Resident trout production capabilities of Woodtick Creek and Moyer Creek are each estimated at 40 pounds of fish per surface acre (May, 1985). Mainstem Moyer Creek, with an existing road paralleling approximately half its length, receives significant fishing pressure during the summer months. Angling opportunities in Woodtick Creek, by contrast, are accessed only by foot or horseback from Panther Creek via the Woodtick Trail, which diverges from the stream below the analysis area.

Anadromous Fisheries

The Woodtick Creek and Moyer Creek drainages are components of the Panther Creek drainage system, which was historically a major producer of both spring/summer chinook salmon and summer steelhead (Reiser, 1986). Utilization of Panther Creek and its tributaries by anadromous salmonids began to decline in the 1940s, however, and has been precluded since the 1960s by chemical pollution of mid and lower mainstem waters that is attributable to operation of the Blackbird Mine (Reiser, 1986, Idaho Department of Fish and Game, 1965). Despite these mainstem water quality problems Panther Creek and its historically utilized tributaries, including Moyer and Woodtick Creeks, continue to be regarded as potentially viable producers of anadromous fish (Northwest Power Planning Council, 1988). The Forest Plan calls for continued management directed toward anadromous stocks in anticipation of correction of mine drainage problems and recovery of mainstem water quality (USDA Forest Service, 1988). Idaho Department of Fish and Game management prescriptions for the two streams calls for a preservation management strategy for anadromous fish stocks, which maintains a harvest closure and may supplement natural recruitment with possible stockings of fry or fingerlings (Idaho Department of Fish and Game, 1991).

Anadromous production capability within the Woodtick Creek system has been estimated at 1,300 steelhead smolts annually. Annual production capabilities in the Moyer Creek system have been estimated at 7,300 steelhead smolts and 36,700 chinook salmon smolts (Northwest Power Planning Council, 1988).

Fish Habitat and Water Quality

Woodtick Creek Drainage

Within the lower portion of the analysis area (Township 19 N, Range 19 E, Section 4), Woodtick Creek is a moderate gradient B type channel (Rosgen, 1985) with an average width greater than 12 feet. The stream exhibits a diverse variety of microhabitats produced largely as a result of an abundance of large woody debris within the channel. Lateral scour pools and dammed pools with water depths of up to three feet are common and provide abundant adult rearing habitat. Numerous shallow edgewater areas and backwater pools contribute to provide dispersed rearing habitat for juvenile life stages.

Stream substrates in this area are dominated by angular quartzite rubble, with smaller gravel accumulations behind obstructions which provide small pockets of spawning habitat. Clean gravels that are relatively free of fine-grained sediment reflect the largely undisturbed nature of this portion of the drainage. Sediment core sampling conducted during the 1992 field season revealed a mean of 15.0 percent fines-by-depth at likely steelhead spawning sites. This level of substrate fines is among the lowest value recorded for Salmon National Forest streams, falling well below Forest Plan standards and guidelines of less than 20.0 percent fines for anadromous fish spawning habitat and less than 28.7 percent for resident fish spawning habitat. Despite a low bank rock content, excellent streambank stability is afforded by a well-established carpet of mosses extending to the water's edge. Streambanks show no evidence of past ungulate damage. In this reach, tall Englemann spruce within the valley bottom provide over 40 percent midday stream shading and up to 75 percent morning and after

noon shading. Minor amounts of supplemental shade are provided by understory vegetation.

An existing 60-inch culvert on Road #107 in the lower portion of the analysis area (Township 20 N, Range 19 E, Section 32) currently poses a barrier to upstream anadromous and resident fish passage under high water conditions.

Within Township 19 N, Range 19 E, Section 3, a large blowdown event has removed most of the tall valley bottom spruce, reducing stream shading to less than 10 percent through a quarter-mile-long reach. Shade canopy in this area is provided intermittently by 10 to 20 foot tall subalpine fir, with the larger accumulations of downfall providing localized shade from direct sun.

Above the blowdown area stream shading of up to 70 percent is restored by a dense spruce canopy. Stream character and aquatic habitat in this reach is similar to that in the lower area, although average stream width is reduced to approximately six to eight feet. Dammed and lateral scour pools as much as two feet deep are abundant.

Goodluck Creek displays significant channel migration at its confluence with Woodtick Creek. Braiding of the stream due to flow obstruction by downfall materials has resulted in an undefined channel mouth, which drops three vertical feet into the Woodtick Creek channel. No pool has formed at this confluence, effectively precluding upstream passage from Woodtick Creek into Goodluck Creek during low flow periods.

Above their confluence Woodtick and Goodluck Creeks are about equal in size and character, with average stream widths of approximately five to six feet and abundant debris-formed pools as much as one and one-half feet deep. Substrate materials in both streams in this area become dominated by cobbles with minor amounts of gravel. Within 100 yards of its mouth, Goodluck Creek exhibits a short but sharp increase in stream gradient before once again flattening out in the vicinity of the proposed road crossing. Above the confluence of Goodluck Creek, Woodtick generally retains the step cascade and high gradient riffle characteristics of the stream below the confluence, but displays significant regions of channel braiding which may define the upper limit of fish passage.

Maximum and minimum stream temperatures recorded at the mouth of Woodtick Creek between June and October 1992 ranged from 36 to 61 degrees fahrenheit. Beneficial use temperature criteria for Coldwater Biota (IDAPA 16.01.2250,04.c) was met during all months sampled, and temperature criteria for Salmonid Spawning (IDAPA 16.01.2250,05.c) was met for the entire fall spawning and incubation period, and all but the very end of the spring spawning and incubation period identified for waters of the Salmon National Forest (Idaho Department of Water Resources, 1975). The brief exceedence of Salmonid Spawning beneficial use criteria to a temperature maxima of 61 degrees during the latter half of June is most likely attributable to an unseasonable transitory warm spell, as maxima for the July sampling period fell back to 50 degrees. pH readings taken during this same June through October sampling period ranged between 7.5 and 8.0, falling well within the range of 6.7 to 8.2 which encompasses 90 percent of the freshwater areas harboring good aquatic faunas (Leitritz and Lewis, 1976), as well as within the pH criteria range for both Cold Water Biota (IDAPA 16.01.2250,04.b) and Salmonid Spawning (IDAPA 16.01.2250,05.b). Dissolved oxygen content at the mouth of Woodtick Creek also exceeded the 6 milligram per liter/90 percent saturation beneficial use criteria for both Cold Water Biota (IDAPA 16.01.2250,04.a) and Salmonid Spawning (IDAPA 16.01.2250,05.a) throughout the sampling period, ranging from 9 to 11 milligrams per liter.

Additional information on Woodtick Creek water quality is presented within the Chapter III Hydrology discussion.

The benthic macroinvertebrate communities of Woodtick and Goodluck Creeks in the proposed sale area are comprised primarily of stonefly and mayfly species, indicating both cold, well oxygenated water of good chemical quality, and clean substrates relatively free of sediment deposition. Caddisfly species appear to be somewhat underepresented in these streams (Rose, 1989-1990; 1991).

Moyer Creek Drainage

Salt Creek and "Perm" Creek are both small perennial streams whose fisheries habitats are largely limited to their lowermost reaches and where low gradient gravel-bottomed riffles and small pools provide

supplemental spawning and nursery habitat to mainstem Moyer Creek fish populations. Although nursery habitats could be used by both resident and anadromous stocks, spawning habitats in these lower reaches are more suitable for resident fish. Additional minor habitat for resident fish populations may occur in the middle reaches of Salt Creek.

The existing culverts near the mouths of Salt and "Perm" Creeks have not been identified as passage barriers. Spawning and rearing reaches above these culverts appear to be more accessible to the spring-spawning rainbow trout than to fall-spawning bull trout, due to improved passage conditions during the spring runoff period. Low flow access is particularly questionable in "Perm" Creek, which exhibits significant braiding immediately above the culvert.

Although not utilized since the 1960's by chinook, the Moyer Creek drainage has been identified as the most important historic salmon spawning tributary of the Panther Creek drainage system (Reiser, 1986). While providing relatively minor amounts of supplemental habitat to the Moyer Creek system, both Salt Creek and "Perm" Creek serve important contributory functions to the maintenance of water quality within the larger Moyer Creek system.

Maximum and minimum stream temperatures recorded at the mouth of Moyer Creek between June and October 1992 ranged from 32 to 54 degrees fahrenheit. Beneficial use temperature criteria for Coldwater Biota (IDAPA 16.01.2250,04.c) was met during all months sampled, but temperature criteria for Salmonid Spawning (IDAPA 16.01.2250,05.c) was exceeded during both the end of the spring spawning and incubation period and the early and mid portions of the fall spawning and incubation period identified for waters of the Salmon National Forest (Idaho Department of Water Resources, 1975). The brief exceedence of Salmonid Spawning beneficial use temperature criteria during the latter half of June is most likely attributable to an unseasonable transitory warm spell, while the exceedence during July, August, and September reflects the more open nature of the Moyer Creek stream channel, which exacerbated drought-induced conditions of summer low flow warming. pH readings taken during this same June through October sampling period ranged between 7.0 and 7.7, falling well within the range of 6.7 to 8.2 which encompasses 90 percent of the freshwater areas harboring good aquatic faunas (Leitritz and Lewis, 1976), as well as within the pH criteria range for both Cold Water Biota (IDAPA 16.01.2250,04.b) and Salmonid Spawning (IDAPA 16.01.2250,05.b). Dissolved oxygen content at the mouth of Moyer Creek also exceeded the 6 milligram per liter/90 percent saturation beneficial use criteria for both Cold Water Biota (IDAPA 16.01.2250,04.a) and Salmonid Spawning (IDAPA 16.01.2250,05.a) throughout the sampling period, ranging from 9 to 11 milligrams per liter.

Additional information on Moyer Creek water quality is presented within the Chapter III Hydrology discussion.

BIOLOGICAL DIVERSITY

Existing Environment

Biological diversity has to do with the diversity of life in all its forms and levels of organization (Hunter 1990). Biological diversity is not so much a matter of maximizing the total number of types of organisms in an area, as it is maintaining the number and variety of plants and animals that historically or perhaps more correctly, ecologically, should occur there. Considering the complexity of natural ecosystems it is obvious that biological diversity is an extremely complicated subject. Two issues have lead to a concern that a reduction in biological diversity has occurred: an accelerated extinction rate for animals and plants and an accompanying decrease in wildlife and plant habitat world-wide.

Since the number of plant and animal species inhabiting native habitats is so great, it is impossible to accurately measure or predict the effects of activities on every species in an area. However, one way to safe-guard biological diversity is to identify the ecosystems that occur in a landscape and then to select a management scheme that, does not eliminate ecosystems or change how they function. The assumption made in this approach, is that if ecosystems are intact, and vegetation associations are not greatly different in composition or proportions than those that occurred naturally in a landscape, then the overall biological diversity of the area will not be disrupted. A second management approach, which preserves habitat for rare species may also be necessary because these plants and animals require special habitat management.

Diversity in the Moyer Salt Landscape (see Figure III-2 Landscape Boundary Map) is best understood by asking three different questions: 1) how unique is this landscape in the region; 2) how unique is it in comparison to landscapes elsewhere on the Salmon National Forest; and 3) how unique are the various landscape components within the landscape?

REGIONAL PERSPECTIVE

Ecosystem is defined as "...all the interacting populations of plants, animals and microorganisms occupying an area, plus their physical environment" (Hunter 1990). The term has been applied to areas the size of a rotten log, as well as, areas the size of continents. In this document, we will use the term in both a regional and a landscape sense, but we qualify the term in each instance.

The Salmon National Forest is located within the north central part of the intermountain west. Due to the latitude, landforms and climatic patterns in the region, there is a diversity of landscape types represented in this large ecosystem. Even considering this variety, the landscapes which compose the Salmon National Forest are similar to those in the rest of the region in that they are predominated by mountainous terrain covered largely by conifer forest vegetation at higher elevations. In addition, they share similar climatic patterns and a common historic disturbance agent, fire.

Although some plant and animal species change geographically within the area, many of the plant/animal communities which are found on the Salmon National Forest can be located throughout the region. The major difference regionally appears to be in the proportions of the various plant communities (e.g. one area will have proportionally more lodgepole pine than Douglas-fir communities while the reverse may be true, elsewhere). These differences reflect the varying aspects, elevations and latitudes in the region. As might be expected the areas which are close to the Salmon National Forest are more similar ecologically than the landscapes and ecosystems which are farther away.

FOREST PERSPECTIVE

The Salmon National Forest itself has a number of landscapes which vary ecologically in the plant communities which occur there. Conifer dominated plant communities are the most common on the Forest and total about 77% of the land area outside the FCRONR (Frank Church - River of No Return) Wilderness. The remainder (23%) is non-forested.

The conifer dominated vegetation associations that occur on the Forest generally fall into one of 6 types. See Figure III-3 for conifer vegetation types and their proportional occurrence on the Salmon National Forest.

In addition to the general vegetation types, a range of forest structures (expressed mainly as ages of the dominant trees) are present for each of the forest community types. These structural sizes include: seedlings, saplings, poles, immature (5 to 9 inches diameter) and mature (greater than 9 inches diameter).

The rarest animal and plant species on the Salmon National Forest are those listed regionally or nationally as Threatened, Endangered, Proposed and Sensitive (TEPS). Of the 36 "listed" species which occur on, or are suspected to occur on, the Forest there are: 5 fish (3 Sensitive), 1 amphibian (Sensitive), 13 mammals and birds (10 Sensitive) and 17 plants (all Sensitive).

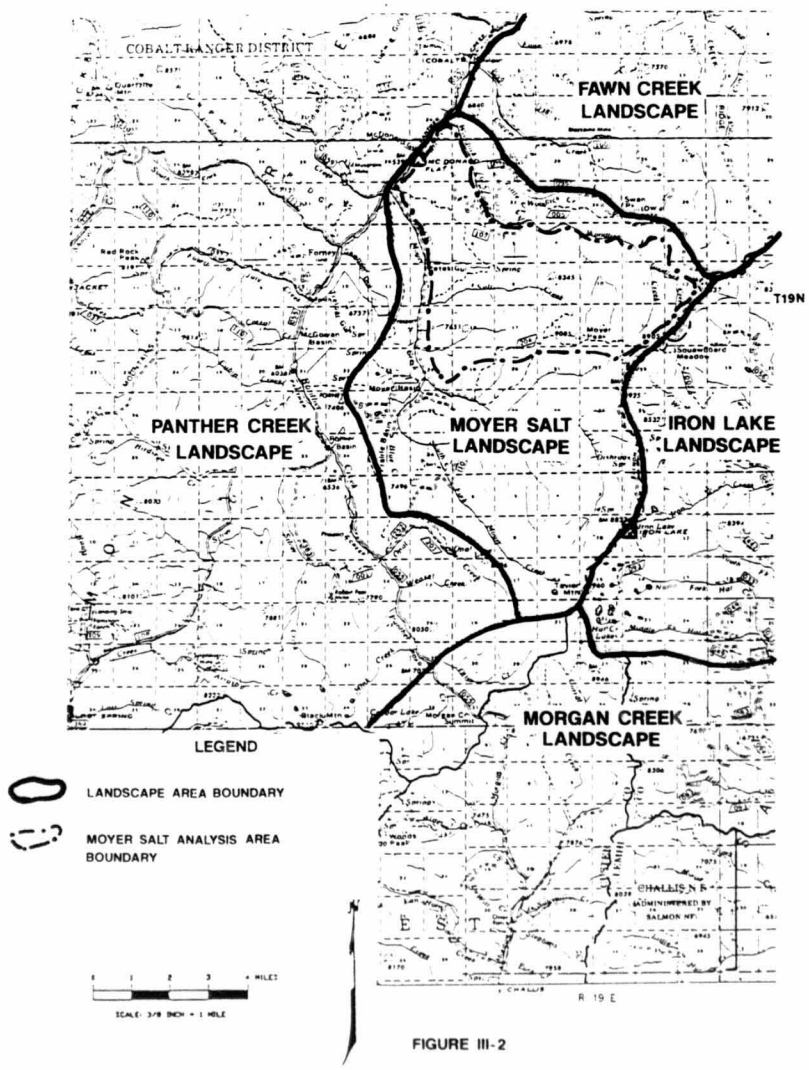


FIGURE III-2

LANDSCAPE BOUNDARY MAP

TABLE III-3: CONIFER VEGETATION TYPES

Community type	% on the Forest
Douglas-fir	20%
Ponderosa pine	7%
Lodgepole pine	21%
Mixed conifer§	6%
Non-Forested (various habitats, all with few or no trees/ acre)	23%
Low productivity (forest of mixed species)	17%
Other (highly erosive land, water, etc.)	6%
Total	100%

§ subalpine fir, Engelmann spruce or Lodgepole pine.

Generally, all of these conifer forest types are represented across the forest.

LANDSCAPE PERSPECTIVE

Community diversity

All of the landscapes which occur in the Salmon River Mountain chain and in landscapes in nearby mountain ranges are occupied by similar plant and animal associations. Generally, at mid-elevation in each of these areas Douglas-fir forests dominate the warm, dry sites and a mixture of lodgepole pine and subalpine fir on the cooler sites at higher elevations. However, each landscape has a unique mix of aspects, soil types and local climate which act to influence the presence or absence of individual plants or the proportion and juxtaposition of the individual communities represented.

The Moyer Salt Landscape is located on the west side of the Salmon River Mountains. This orientation affects the vegetation on the landscape in two obvious ways. First, the northeast exposure reduces the amount and intensity of the sun's energy received at most sites in the landscape. Second, the high crest of the Salmon River Mountains acts to "wring-out" moisture from the predominant western moving storms, increasing annual precipitation as you increase in elevation within the landscape. The overall effect is a comparative increase in moisture and decrease in temperature in this landscape. Other landscapes located on the west side of the Salmon River Mountains share a similar temperature and moisture regime.

The result of these local environmental conditions is that at lower elevations non-forested grass/shrub communities occur. Here white-tailed jackrabbits, vesper sparrows and sage thrashers are residents. As elevations increase there is an accompanying increase in moisture and as a result the mid-elevation slopes are covered with conifer forest, principally Douglas-fir trees. Intrusions of grass/shrub communities are common at mid-slope on dry south slopes, but at higher elevations, these breaks in conifer habitat become less common and a mixture of lodgepole pine and subalpine fir predominates. The conifer forest is home to a wide variety of wildlife species including deer and elk, goshawks, three-toed woodpeckers and snow-

shoe hare. Near the Taylor Mountain Peak area, the land becomes very steep and rocky and is barren except for patches of scattered trees and plants adapted to high elevations. Animals like mountain goats, pikas, rosy finches and hoary marmots are residents of this area.

This juxtaposition of different non-forested and forested plant communities, both due to elevation and aspect, creates a diverse ecological setting. In fact, 17 different ecosystems or "patches" have been identified in the landscape. Seven of these patches are different Douglas-fir communities, 4 are mixed conifer (a mix of subalpine fir, Engelmann spruce and/or lodgepole pine) forest patches, 2 are lodgepole pine forest patches, 3 non-productive (in a timber sense) mixed conifer forest patch, one patch which is open water, and one non-forested ecosystem patch. It should be noted that the "non-forested" patch is itself composed of many different communities which have been lumped for the benefit of this discussion. These communities range from associations dominated by big sagebrush/ bluebunch wheatgrass to rock outcrops where, lichens are the dominant vegetation.

Diversity in plant species and vegetation structure also occurs within each conifer forest association in the landscape. Here communities are dominated by one of four major conifer types (or a combination of several) and three different age structures (see Table III-4: Forested Ecosystems). In fact, the only age structure normally found in landscapes dominated by conifer communities which is almost absent in the Moyer Salt Landscape is the earliest seral stage - seedlings and saplings. In the existing landscape the seedling and sapling forest structure is only represented by approximately 1% of the landscape area.

Table III-4: Forested Ecosystems For the Landscape Level *

Community type	Total acres	% of the conifer forested communities	% of the land-scape
Mature Douglas-fir	4,514	16	12.2
Immature Douglas-fir	7,991	28	20.3
Pole Douglas-fir	163	1	0.4
Seedling/sapling-DF	24	1	0.2
Mature Mix Conifer	2,334	9	6.4
Immature Mix Conifer	4,909	18	13.2
Poles Mix Conifer	5,475	20	14.8
Seedling/sap Mix Conif.	303	1	0.9
Immature Lodgepole	543	2	1.6
Poles Lodgepole	1,151	4	3.2

* A detailed discussion of the grasses, forbs, sedges, shrubs, and tree species that occur in any of these forested plant associations is contained in Steel et al. (1981).

Each community type (and perhaps structural stage) has its own dependant animal species. Some species are found in many different habitats while others occur in specific plant communities which have reached certain structural stages and are found nowhere else. Perhaps the best example from the Moyer Salt Landscape of animals which use many different habitats are elk and deer. These big game animals can be found in most any habitat in the landscape since some communities are used for foraging and others provide thermal or hiding cover. Conversely, pine marten and pileated woodpeckers usually occur only in mature spruce/fir or Douglas-fir communities, respectively.

The size of the area each patch occupies in the Moyer Salt Landscape varies. The average is 86 acres (calculated for both forested and non-forested patches) and the average forested patch size is 131 acres. Forested patches for all forest community types range in size from approximately 7 acres to 2,545 acres. There are 436 different patches in the Moyer Salt Landscape. Since the average patch size is 86 acres and there are over 436 patches in the landscape it is apparent that the landscape is relatively diverse.

Unique Habitats

Activities which reduce the amount of inherently rare habitats or ecosystems in a landscape will reduce landscape biological diversity commensurately. Two unique habitats which are of special interest in the project area (south side of Woodtick Creek and Salt Creek) are riparian areas which have high biological diversity and old growth habitats which are home to some relatively rare wildlife species.

There are about 5,300 acres of old growth forest in the project area (south-side of Woodtick and Salt drainages. Much of this old growth is Douglas-fir forest. Wildlife species that depend on mature to old growth habitat in the Moyer Salt Landscape include red cross-bills, northern goshawks, boreal owls, western tanagers, pileated woodpeckers and pine martens. In addition, other species which are less restrictive in their habitat preference, like elk and deer, use old or mature timber stands for thermal and hiding cover in the landscape.

Wetlands are another unique habitat found in the Moyer Salt Landscape. The wetlands occurring in the landscape are vegetated by several different plant communities including different types of willow and sedge dominated associations. In addition, these wetlands are derived from small ponds and springs, as well as, from creeks of various sizes. This influences the width and density of wetland vegetation produced. Even though wetlands make up a small part of the landscape they are probably the most productive vegetation types in this landscape in terms of plant biomass produced and the number of wildlife species which use them as primary habitat and travel corridors. For an area of estimated direct effects (much smaller than the landscape) of proposed roads and harvest areas, there is approximately 30 miles of riparian stringer wetlands; 15 acres of isolated wetlands and 14 acres of wet meadows. Wildlife species that are restricted to wetlands in the Moyer Salt Landscape include: yellow warblers, willow flycatchers, the western jumping mouse, northern water shrews, mink and beavers. In addition, moose are a resident of wetlands in the landscape.

Past timber management activities have had little affect on existing wetlands in the area of proposed timber activity. Existing Roads #107 crosses a riparian spruce wetland on Woodtick Creek and several other smaller stringer riparian wetlands. These crossings have not had any serious effects to wetlands. A jeep trail below Moyer Peak crosses a narrow riparian spruce wetland and there is no bridge or culvert in place to facilitate vehicle crossing. Consequently, during the wet season the jeep trail is boggy in this location, though impacts to the wetland are minor.

Wildlife

Most of the animal and plant species that are known to occur in the Moyer Salt Landscape are common to landscapes elsewhere in the northern part of the intermountain west (see species list in Appendix D and E of the FEIS). The common game animals, furbearers, old growth dependent birds and songbirds are listed in the wildlife sections of this FEIS.

A loss in biological diversity should be most evident in rare animal and plant species. There

are 12 species of regionally or nationally listed Threatened, Endangered, Proposed or Sensitive Species known or suspected to occur in the Moyer Salt Landscape: northern Rocky Mountain gray wolf, North American lynx, northern goshawk, wolverine, western big-eared bat, boreal owl, northern three-toed woodpecker, great gray owl, spotted frog, Lemhi penstemon and bull and western cutthroat trout. Of these species, only the goshawk, lynx and bull and cutthroat trout have been observed in the landscape. Habitat has been identified for spring and summer chinook salmon and steelhead trout in the Moyer Salt Landscape, therefore, the habitat could be affected by proposed actions which may occur in the landscape.

Wolves and chinook salmon, are listed under the Endangered Species Act as endangered and threatened, respectively. Both were once residents in the landscape and although some potential exists that dispersing wolves use the area it is doubtful that either of these animals reside in the landscape today. The causes of decline of each of these species are unrelated to past or proposed timber management in the Moyer Salt Landscape.

TIMBER RESOURCES

This section discusses the timber resources of the analysis area in terms of: past timber harvest activities, fire history, and climatic events that affect the condition of the stands at present; suitable acres of timberland; site potential; age-class distribution and condition classes of the timber resource; insect and disease infestations; and fire management.

PAST ACTIONS THAT AFFECT THE PRESENT CONDITION

Historic Fire Patterns

Both even-aged and uneven aged stands occur throughout the analysis area in a mosaic pattern. The current age and diameter distribution and species composition result in part from the area's fire history. Evidence of fire is seen in the form of burned snags, stumps, and fire scarred trees. Additional evidence of more recent intense fire activity in the lodgepole pine community is seen in substantial acreages of pole-sized lodgepole pine dominating the landscape at the project level. Less intense fire levels have occurred in the Douglas-fir community, as evidenced by fire-scarred overstory trees, minimal amounts of down, woody debris, and various distinct age distributions of trees.

Drought

Forests throughout Idaho have been experiencing drought since 1985. The effect of drought on trees in the analysis area has been to reduce health and vigor. Life processes, respiration, photosynthetic products, and nutrient storage are all reduced. As a result of reduced vigor, resistance to disease and insect infestation is lower and as a result, insect activity has increased. If drought conditions persist it is likely that loss of tree growth and tree mortality due to various insects and diseases will continue or increase.

Past Timber Harvest Activity

Previous timber harvest activity has occurred within the Moyer Salt Timber Sale analysis area. Area that were cut in the early 1970's have been certified as fully stocked. Units that were cut less than five years ago have not been certified yet. Prescribed tree stocking and regeneration certification is based on fifth year stocking standards established in the Intermountain Region Reforestation Handbook and the Salmon National Forest Plan that are adjusted for local conditions.

Approximately 500 acres within the analysis area were cutover in 1973 and 1974 in the Salt Creek Timber Sale. Within the Douglas-fir community a diameter limit cut was done that removed all trees greater than 12 inches DBH. In 1977 approximately 250 acres of these cutover areas that were understocked were scarified. Post-sale timber stand exams were performed in 1985 and 1990 and the stands were found to be fully stocked and in need of treatment by timber stand improvement techniques such as overstory removal and thinning.

Within the lodgepole pine community approximately 128 acres were clearcut harvested in 1989 as part of the Tick Creek Timber Sale. These units were comprised of mixed conifer

stands that occur on the subalpine fir habitat type that are similar to those found in the Moyer Salt Timber Sale analysis area. Examinations to determine third year stocking levels will be completed in the 1992 field season. Similar stands that have been clearcut on the Cobalt Ranger District have been successfully restocked within five years. Stocking levels may be as high as 4,000 trees per acre.

Insects and Disease

A variety of forest insects and diseases are known to exist in the analysis area. Their presence was detected during field exams and other site visits and by aerial survey conducted by the Forest Service's Forest Pest Management division. Some of these insects and diseases are causing defoliation, reduced growth, or mortality in the stands. Others are present at levels that are not significantly affecting the growth and vigor of forest stands. Still other insects and diseases pose a potential threat to the stands unless measures are taken to prevent infestation.

Western Spruce Budworm (*Choristoneura occidentalis Freeman*): Light to moderate infestation by western spruce budworm has occurred in the analysis area. Douglas-fir trees are the primary hosts for this insect in this area, although subalpine fir and Engelmann spruce trees are also affected. Douglas-fir trees that grow on dry sites are more heavily infested. The western spruce budworms feeds on the current year needles and terminal buds of these trees. It overwinters in the overstory and then drops to the understory trees. Because the younger trees have a higher percent of young needles than older trees, the overstory trees are generally slightly defoliated but understory hosts are moderately to severely defoliated. Given the present multi-storied structure of the host stands, continued infestation and defoliation is expected to result in reduced growth in the overstory and potential mortality in the understory.

Lodgepole Pine Dwarf Mistletoe (*Arceuthobium americanum*): Dwarf mistletoe is a parasitic stem and needle pest that affects mostly lodgepole pine trees in the analysis area. Lodgepole pine dwarf mistletoe is common throughout the project area, and present infection levels are moderate to high. Dwarf mistletoe plants cause stem cankers or swelling of the branches and stems of host trees. Significant height and diameter reductions can occur in heavily infected areas, especially in young seedling and sapling stands. The most serious threat occurs when regeneration is overtopped by an infected overstory, and seed from the mistletoe can fall on and infect the regeneration. Because lodgepole pine is expected to be a significant component in regenerated stands, the presence of lodgepole pine dwarf mistletoe could cause increased mortality and reduced growth of the regenerated stands if not adequately addressed in silvicultural treatments. Clearcutting is the optimal treatment for these stands because no infected trees would remain on the site to infect the regenerated trees.

Mountain Pine Beetle (*Dendroctonus ponderosae*): The mountain pine beetle flourishes in stands of mature lodgepole pine, especially in stands where the average age is greater than eighty years. Within the lodgepole pine forest community in the analysis area, about 98 percent of the stands are comprised of lodgepole pine trees that are more than 80 years old. Therefore, stands in the area are highly susceptible to infection. Not only are these stands old, but they were previously attacked in the 1930's, they are getting larger (diameters are again approaching 9 or more inches), and tree vigor is poor due to age and dwarf mistletoe infection. Stands in similar condition are present in adjacent drainages, and if infection occurs in one portion of these stands it could spread rapidly throughout the entire area. If a mountain pine beetle attack occurs, mortality may reach 50 percent or more of the lodgepole pine stands. Effects would obvious: mortality would spread quickly; for three to ten years the foliage would turn red as the trees die; eventually they would fall off and the forest would be comprised of "gray ghost forest". Down and dead fuel accumulations would build as the trees fall to the ground, and risk of a stand-replacement fire would be high.

A number of rating systems exist for evaluating the susceptibility of lodgepole pine stands to attack by mountain pine beetle. According to a system devised by Amman et al (1977), which considers latitude, elevation, and stand age, the current rating for these stands is moderate. Given the age and size conditions of these stands, the history of insect infestations, and the poor tree vigor, described above, it is reasonable to assume that the susceptibiliy of these stands to infestation is increasing.

Douglas-fir Beetle (*Dendroctonus pseudotsugae*): Evidence of Douglas-fir bark beetle can be found throughout the project area in infestation centers characterized by isolated clumps of one to three dead or dying trees. Prolonged beetle activity has resulted in patches up to one acre in size of dead or dying trees. Douglas-fir trees greater than 14 inches DBH and more than 100 years old are at high risk for bark beetle attack. At present Douglas-fir stands are experiencing low tree vigor and stress conditions brought about by prolonged drought; under these conditions, damage to smaller size and younger age classes of Douglas-fir may occur.

Western Balsam Bark Beetle (*Dryocoetes confusus Swaine*): Evidence of western balsam bark beetle can be found in the project area. This pest seems to prefer subalpine fir that is weekened by pathogenic fungi and/or drought conditions. Patches of ten to twenty infected trees were detected during the 1991 aerial detection survey. The trees in these patches were greater than 14 inches DBH. and more than 120 years old. Potential for increasing activity by the insect should be monitored.

Other Insect and Disease Problems: Various root and heart rots are endemic in the area. These conditions affect older stems and increase susceptibility to windthrow, breakage, and bark beetle attack. Potential for wider infestation or additional damage is not known.

Suitable Timberland

Of the 15,360 acres in the analysis area, 11,292 acres are in the suitable timber base defined in the Forest Plan (Forest Plan, IV-37-40) (Table III-5). These lands were allocated to timber management as a result of Forest Plan suitability analysis and include:

1) Productive Forest land where the technology is available that will ensure that timber production will not result in irretrievable soil and watershed resource damage;

2) Lands where suitable 5-year regeneration can be assured; and

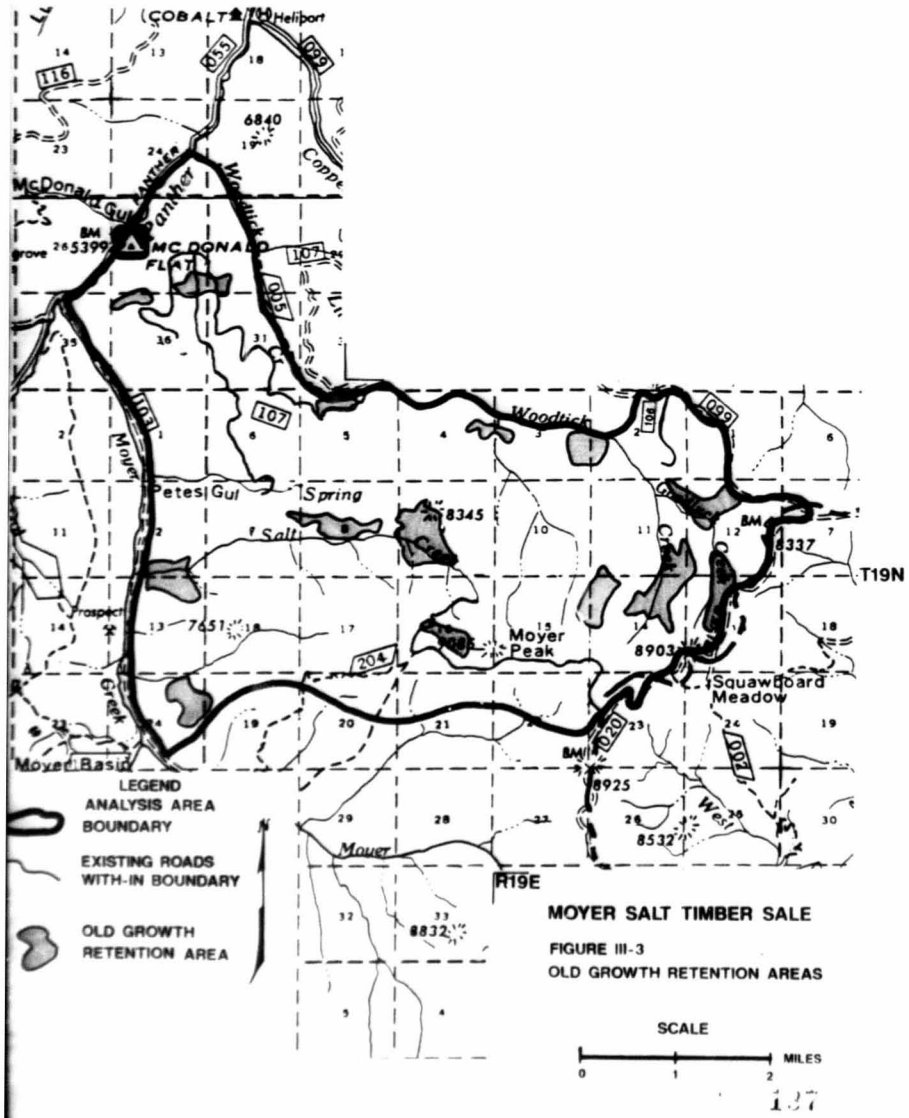
3) Lands not withdrawn by legislative action (wilderness areas, etc.) or not appropriate for timber production (riparian areas, old-growth retention stands, etc); and

4) Lands for which management direction indicates that timber production is an appropriate use of the area (Management Areas 3A-5A, 3A-5B, 3A-5C, 4A, 4A, 5A, 5B, 5C, and 8A).

Table III-5: Timber Classifications of the Moyer Salt Timber Sale Analysis Area

Classification	Acres
Suitable Timberland:	
Unharvested	10,664
Harvested	628
Unsuitable Timberland:	
Old Growth Protected *	1,524
Non-forest or Unproductive	2,129
Riparian Areas	415

* See Figure III-3 for a map showing locations of old growth retention stands.



Site Potential

Habitat types are useful for predicting the site potential (or estimated yield capabilities, in cubic feet of wood fiber per acre per year) of an area (Steele et al., 1981). Douglas-fir and subalpine fir habitat types that would be harvested in the analysis area generally have site potentials similar to those shown in Table III-6 (Steele et al., 1981). While yield capabilities in the area are about average for the Forest (40-50 cubic feet/acre/year), most stands are old and no longer growing at a productive rate, and thus are producing much less than this amount.

Table III-6: Site Potentials for the Habitat Types of the Moyer Salt Analysis Area*

Habitat Type	Site Potential*
Douglas-fir/pinegrass (PSME/CARU)	28-80' *
Subalpine fir/pinegrass (ALBA/CARU)	35-80**
Subalpine fir/grouse whortleberry (ALBA/VASC)	42-78**
Subalpine fir/sitka alder (ALBA/ALSI)	35-80**

*from Steele et al., 1981, Appendix E-2
**net yield capability of Steele et al., measured in ft of woody material/acre/year

Vegetative Age/Condition Distribution

The current age distribution of the timber stands in the Moyer Salt Timber Sale analysis area is shown in Table III-7. Currently less than 5% of the forested areas in the analysis area are in age class 1 or 2. The remaining 95% of the stands in the analysis area are in age classes 4 and 5 (for Douglas-fir) and in 3 and 4 (for lodgepole pine). Lodgepole pine stands may be as old as 120 to 140 years while Douglas-fir stands may exceed 160 years old and be as old as 210 years.

Lodgepole pine and Douglas-fir in the analysis area would be considered to be in a mature condition class at approximately 80 and 120 years of age respectively. Thus, about 98 percent of the analysis area is currently occupied by only two condition classes, mature and overmature/old growth.

Fire, insects, diseases, timber harvesting and other natural or man-caused disturbances typically will alter the distribution and abundance of condition classes in an area. These processes result in a mosaic pattern of mature forest, younger forest, openings, and edges. Where fire is excluded, however, such as in the Moyer Salt Timber Sale analysis area, the area will typically be comprised of only one or two condition classes.

Table III-7: Estimated Age Distribution for the Douglas-fir and Lodgepole Pine Forest Communities

	Douglas-fir Community		Lodgepole Pine Community	
Age	Percent of Area	Acres	Percent of Area	Acres
0-39 years	12%	500ac	2%	128 ac
40-79 years	0	0	0	0

Age	Percent of Area	Acres	Percent of Area	Acres
80-119 years	0	0	17%	1,500 ac
120-159 years	46%	1,892 ac	81%	7,064 ac
160+ years	42%	1,732 ac	0	0

Noxious Weeds

Several species of noxious weeds have been spreading throughout the State of Idaho and the Salmon National Forest over the past few decades, causing a variety of concerns on both agricultural and forested lands. Resources on the Salmon National Forest lands that are affected by noxious weeds include range, wildlife habitat, biological diversity, including sensitive plants, and recreation. On agricultural land crop yields may be reduced and rangeland productivity may be affected. The Salmon National Forest has established a weed control program that utilizes appricaltion of chemical herbicides.

Noxious weeds, in particular knapweed (*Centaurea maculosa*), are present elsewhere on the Cobalt Ranger District. These weeds can be transported by road building or timber harvesting equipment, animals, private vehicles and on clothing. There are currently no known infestations of knapweed in the analysis area.

WILDLIFE RESOURCE

Forest Plan Goals and Objectives

Wildlife management direction includes providing habitat of sufficient quantity and quality to sustain target populations of economically important management indicator species and to at least maintain minimum viable populations of all other management indicator species; improve elk habitat to achieve a moderate increase over current (1988) population levels and to provide diverse habitat and elk security; and to enhance fisheries habitat.

Affected Area

The area in which wildlife species would be directly affected by this proposal includes approximately 11 square miles of habitat located north and west of Moyer Peak in the Woodtick Creek and Moyer Creek drainages, both of which are tributaries to Panther Creek (Figure III-4).

Wildlife Species Considered

Wildlife species that occur in the analysis area or whose habitat exists in the analysis area but have not been sighted to date are shown on the species list in Appendix D. Wildlife species considered in detail in this analysis include those non-Threatened, Endangered and Sensitive Species identified by the public and other agencies during the scoping process (elk and mule deer) and/or species that are listed as "Management Indicator Species" in the Forest Plan. A Management Indicator Species (MIS) is a wildlife species selected to reflect effects of management activities on the animal community, and its condition can therefore be used as an indicator to assess the impacts of management action on a particular area. Federally listed Threatened and Endangered species, those species listed on the Forest Service Intermountain Region Vertebrate Sensitive Species List, and those species identified as "Species of Special Concern" by the Conservation Data Center are discussed in the "Threatened, Endangered and Sensitive Species" section that follows.

Big Game (Ungulates)

Ungulates that occur within the analysis area include elk, mule deer and mountain goats. Of these species, elk and mule deer are most

abundant and occur throughout the entire area. The forested/nonforested edges of forested stringers separated by openings and the patches of aspen trees on the Moyer Creek face and in Salt Creek are used as calving, fawning and nursery areas by elk and mule deer. Mountain goats can be found in the upper elevations of the Woodtick Creek and Moyer Creek drainages. Within this analysis area they are commonly observed on large rock outcrops in the Woodtick Creek drainage near its confluence with Goodluck Creek. Goats winter in the steep, rough mountain mahogany stand in that portion of the Woodtick Creek drainage.

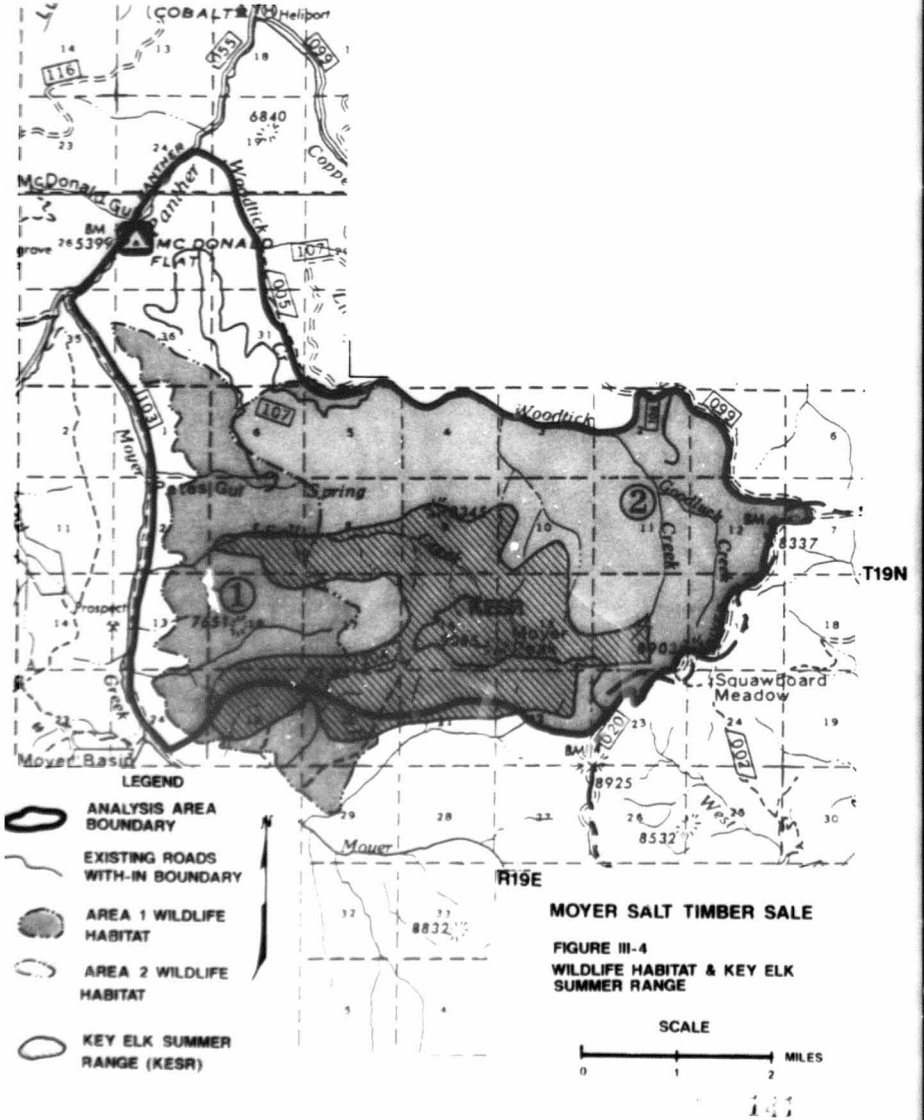
Approximately half of the analysis area has been mapped as key elk summer range (KESR) (Figure III-4); however, the entire area receives heavy spring, summer and fall elk and mule deer use. Most of these animals move down the Woodtick and Moyer Creek drainages and/or down Panther Creek to winter. Limited numbers of both species winter within the analysis area, especially in the western portion around Salt Creek and Pete's Gulch. Elk winter range also occurs on the lower elevations of the Moyer Creek face and in the Salt Creek tributary to Moyer Creek.

From a big game habitat perspective, the habitats present in the analysis area are very diverse. Forested lands below approximately 7500 feet elevation are composed primarily of habitat types in the Douglas-fir (PSME) series whereas those in the higher elevations are in the subalpine fir (ABLA) series. The analysis area was therefore divided into two habitat types, Areas I and II (Figure III-4), and separate effects assessments for elk were completed for each area.

Area I, the lower elevations along the Moyer Creek face (Figure III-4), consists primarily of Douglas-fir timber stands in the Douglas-fir/pinegrass habitat type, with minor mixed conifer (Douglas-fir, subalpine fir, Englemann spruce, and lodgepole pine) timber stands in the subalpine fir/grouse whortleberry habitat types. Natural timber/nontimber ecotones, openings dominated by sagebrush and bunch grasses, and small aspen stands or clones occur throughout this area in conjunction with blocks, stringers and islands of timber. Little, if any, past timber harvest has occurred in this area and most of the timber stands, particularly the Douglas-fir stands, are in an old growth condition (most trees are more than 200 years old, a mixture of age classes is present, and the stand is in a natural mature to overmature state).

The diverse nature and juxtaposition of the many habitat types present in Area I contribute to very high habitat values for many wildlife species, including most of the management indicator species (MIS). The stringers and islands of timber and their associated timber/nontimber ecotones give Area I very high habitat potentials for mule deer and elk. Elk habitat potential (EHP) is commonly determined by using a calculated cover:forage ratio as an index with a 40:60 ratio being optimum. Although big game cover is present in pristine amounts and distribution, the cover:forage ratio in this portion of the area is approximately 32:68 and thus is slightly cover-limiting and is below optimum. The Douglas-fir/pine grass (PSME/CARU) habitat type, abundant in this area, is very important for elk calving and deer fawning, and the area was mapped as key elk summer range during the Forest planning process (Figure III-4). The small aspen stands and riparian areas found throughout this area contribute to the habitat diversity and receive a disproportionate amount of use by both elk and deer. Mountain goat use is confined primarily to rock outcrops in the Douglas-fir habitat types and nontimbered rocky areas dominated by mountain mahogany.

Area II, the upper elevations generally surrounding Moyer Peak, is dominated by fairly uniform stands of mixed conifers, including lodgepole pine and subapline fir with some Englemann spruce in the more mesic sites. This area is almost entirely within the subalpine fir/grouse whortleberry habitat type. Very few natural openings exist and habitat diversity is low. However, this area has not been previously entered and timber stands in old-growth condition are abundant. The cover:forage ratio is approximately 80:20 and therefore is forage-limiting. This area offers extremely good big game hiding and/or security cover. Wetter subalpine fir stands, especially in the heads of drainages, receive heavy summer elk use. The drier lodgepole pine and subalpine fir stands on major ridgetops receive heavy fall use by both elk and mule deer.



Other Wildlife Species

Black bear and cougar occur throughout the area and utilize all habitat types. Black bear are most commonly associated with riparian areas and densely timbered north-facing slopes. Cougar use depends upon the seasonal use of various habitats by primary prey species such as mule deer, elk and snowshoe rabbits.

Bobcats, coyotes, pine marten and beaver are common furbearers. Bobcats and coyotes use all habitat types. Pine marten are found primarily in the mature spruce/fir stands in the bottoms of each major drainage and in the adjacent mature lodgepole stands. Beaver are found in both Woodtick Creek and Moyer Creek.

Blue, ruffed and Franklin's (spruce) grouse occur throughout the area. Ruffed grouse are most common along riparian areas, blue grouse are most common in the Douglas-fir habitat types, and spruce grouse are found in the lodgepole and subalpine fir types.

Cavity nesting and/or old growth dependent MIS, including goshawks, pine marten, great gray owls, pileated woodpeckers and brown creeper, are found throughout the analysis area. Populations of these species are high due primarily to the relatively pristine old-growth habitat component. One goshawk nest has been observed in the Salt Creek drainage but is not within a proposed cutting unit boundary or near a proposed road.

Other MIS found in this area include vesper sparrows in sagebrush habitats, yellow warblers in the willow communities, ruby-crowned kinglets in the mature and immature Douglas-fir habitats, yellow-bellied sapsuckers in the quaking aspen clones, brown creeper in the mature lodgepole pine and subalpine fir stands, and mountain bluebirds along the timbered/nontimbered ecotones.

THREATENED, ENDANGERED AND SENSITIVE SPECIES

Forest Plan Goals and Objectives

Forest Plan management goals for listed and proposed Threatened, Endangered and Sensitive species is to manage classified Threatened, Endangered and Sensitive Species habitat to maintain or improve their current status. As required by the Endangered Species Act of 1973, a Biological Assessment of listed and proposed threatened or endangered species of plants and terrestrial vertebrates was prepared for the analysis area and is contained in Appendix F.

A Biological Assessment (BA) of the effects of the proposed road construction and timber harvest alternatives was prepared for the Moyer Salt DEIS (see Moyer Salt DEIS, Appendix F).

After public review of the DEIS, the BA was updated to address three additional harvest alternatives. This document found the Alternative 1 (No Action) to have "No Effect" on Snake River spring/summer chinook salmon, Alternatives 2, 4, 5, 6, and 2A to be "Not Likely to Adversely Affect" Snake River spring/summer chinook salmon, and Alternative 3 to be "Likely to Adversely Affect" Snake River spring/summer chinook salmon. All proposed alternatives were considered to have "No Effect" on Snake River sockeye salmon.

Recent agreements between the Forest Service and the National Marine Fisheries Service, however, have specified both a modification of BA formatting, and expansion of project analysis to encompass possible cumulative subbasin effects as well as direct and indirect project level effects. The final Moyer Salt Biological Assessment of effects to Snake River spring/summer chinook and sockeye salmon is, therefore, being documented within the Salmon National Forest's Proposed Activity Review for the Panther Creek Watershed.

The effects analysis methodology specified for the Proposed Activity Review places a strong emphasis on risks of temperature and sedimentation effects. As the original, independent BA prepared for the Moyer Salt DEIS and FEIS doc-

uments included discussions of these temperature and sedimentation risks, conclusions within the pending Proposed Activity Review are not expected to deviate from those of the independent analysis included within this EIS.

A Biological Evaluation for Forest Service Region 4 Sensitive Species of plants, terrestrial vertebrates, and aquatic vertebrates was prepared and is included in Appendix G.

Threatened and Endangered Plants and Terrestrial Vertebrates

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, the U.S. Department of Interior Fish and Wildlife Service (USFWS) was notified of the proposed action. The original species list (FWS 1-4-91-SP-204) which they provided on 1/29/91 did not include any listed species. However, when this list was updated on 3/31/93, the Endangered gray wolf was added and a Biological Assessment was subsequently prepared (Appendix F).

As stated in the Biological Assessment, this analysis area offers potential gray wolf habitat but no wolves are known or suspected to occupy the area at this time. The entire area is included within the Central Idaho Wolf Recovery Area and may become important to this species at some point in the recovery process.

Threatened and Endangered Aquatic Vertebrates

Columbia River spring/summer chinook salmon have recently been listed as "Threatened" by the National Marine Fisheries Service (Federal Register, April 22, 1992; Effective date May 22, 1992). This species has historically utilized mainstem Moyer Creek spawning and rearing habitats (Reiser, 1986), but they died out in the 1960's due to water quality problems related to acid mine drainage.

Sensitive Plants

The current Forest Service Intermountain Region Sensitive Plant Species list for the Salmon National Forest contains 12 species. A review of the various habitats that these plants are found in, as well as a review of occurrence reports, eliminated all but one, *Penstemon lemhiensis*, from the Moyer Salt analysis area (Biological Evaluation, Appendix G).

Penstemon lemhiensis occurs in open sagebrush grasslands and in the forested PSME/AGSP, PIPO/AGSP, and PSME/FEID habitat types in gravelly, rocky soils at elevations between 4,200 and 8,100 feet. It has been found in the Panther Creek drainage but not within the proposed project area. Currently listed as Sensitive by the Intermountain Region of the Forest Service, it has been recommended as a Category 2 Candidate Species by the Fish and Wildlife Service.

Sensitive Terrestrial Vertebrate Species

Eight species from the Forest Service Intermountain Region Vertebrate Sensitive Species List were assessed to determine whether they are present or their habitat is present in the analysis area. Habitat for the Northern goshawk is present throughout the area in dense, old-growth conifer, mixed conifer/aspen, and aspen stands. One nest site is known to occur in the area, and others may be present but have not been sighted. North American lynx habitat occurs throughout the analysis area in mixed spruce and subalpine fir forests near riparian zones or openings where their primary prey, the snowshoe hare, occurs. Wolverine habitat is confined to montane boreal regions with low human habitation and generally occurs at higher elevations than the analysis area. The western or Townsend's big-eared bat's distribution range includes the analysis area but little is known about the suitablity of forests for their habitat. Boreal owls nest in mature or overmature stands within the subalpine fir habitat types that have open understories and multi-layered canopies. Suitable habitat may occur in the upper-elevation portion of the analysis area. The Northern three-toed woodpecker generally occurs in spruce-fir or limber pine-whitebark pine zones but at elevations higher than those in the analysis area. Great gray owls utilize lodgepole pine forest as well as subalpine fir forest and may occur throughout these forest communities in the analysis area. Spotted frogs are found in cold permanent water and may be present in any of the streams in the analysis area.

Although habitat for each of these species occurs in the analysis area, only the Northern goshawk has actually been observed in the area. A Biological Evaluation was prepared that assessed the potential effects of the proposed activities on sensitive species (Appendix G); these effects are summarized in Chapter IV of this document.

Sensitive Aquatic Vertebrate Species

Bull trout (Dolly Varden), a Forest Service Intermountain Region Vertebrate Sensitive Species (VSS) and Idaho Department of Fish and Game Species of Special Concern (SSC), are known to be present in the mainstem reaches of both Woodtick Creek and Moyer Creek (Buram et al, 1990). Habitat for steelhead trout, also a Forest Service Intermountain Region Vertebrate Sensitive Species, exists in both Moyer Creek and Woodtick Creek but is not currently utilized because of downstream water pollution of Panther Creek due to acid mine drainage. Westslope cutthroat trout, a Region 4 Sensitive Species, occur in Panther Creek above Musgrove Creek but are not known to occur in Moyer or Woodtick Creeks. The effects of the proposed action on these species are discussed in the Biological Evaluation (Appendix G) and summarized in Chapter IV.

ROADLESS AREA RESOURCE

Forest Plan Goals and Objectives

General direction for each of the roadless areas is given under its designated Management Area (MA) direction. Each roadless area has been divided into MAs that prescribe a set of directions or goals and are listed in detail in the Forest Plan.

Affected Area

The Taylor Mountain Roadless Area is the only inventoried roadless area that would be affected by the alternatives for this proposed action. The Taylor Mountain Roadless Area is part of the Salmon River Mountain Range and is located approximately 16 air miles southwest of Salmon, Idaho (Figure III-5). The Taylor Mountain Roadless Areas has a total approximate size of 63,220 acres. Approximately 48,280 acres of the northern portion of this roadless area are administered by the Salmon National Forest and the remaining 14,940 acres are administered by the Challis National Forest. Only the northern portion of the roadless area would be affected by the proposed action.

The Taylor Mountain Roadless Area is identified as Roadless Area Number 13-902 on the Salmon National Forest (formerly RARE II No. 4-502), and as Roadless Area Number 06-902 on the Challis National Forest (formerly RARE II No. 4-502) (Figure III-5).

The roadless analysis section for the Taylor Mountain Roadless Area is tiered to the Final Environmental Impact Statement (FEIS) of the Salmon National Forest Land and Resource Management Plan (Appendix C, pg C-20 through C-32, 1988).

During the Forest planning process the Taylor Mountain Roadless Area was evaluated for possible recommendation for inclusion in the National Wilderness Preservation System (NWPS). The Regional Forester's decision in the Salmon Forest Plan recommended that the area not be included in the wilderness system. Appendix C of the FEIS for the Forest Plan contains an overview description of this area, a discussion of its wilderness features, an evaluation of the various nonwilderness multiple-use resources, an assessment of the environmental impacts of alternative land management emphases, and a summary of the public comments regarding whether the area should be recommended for Congressional designation as part of the National Wilderness Preservation System (Forest Plan FEIS, Appendix C, pages 20-32).

The north end of Taylor Mountain Roadless Areas is accessible from Forest Roads #020, #055, #062, #099, and #107. Foot trails traverse the southern half of this portion of the roadless area and provide access to the Hat Creek Lakes area and the Opal Lake area. There are no Forest Service-maintained trails in the northern half of the roadless area.

Existing Condition

The Taylor Mountain Roadless Area appears undeveloped to most visitors. Effects of human activities are limited to the fringes of the Road-

less Area where Forest roads, jeep trails and foot trails are located and along the Moyer Peak jeep trail located in the northern portion of the roadless area.

Salmon National Forest Plan management area prescriptions for the Taylor Mountain Roadless Area permit timber harvest and road construction. Approximately 40 percent of the roadless area is in management areas that include timber management objectives. The remaining 60 percent of the area has management prescriptions for semi-primitive motorized recreation opportunities. Timber harvest is not planned in these areas.

The Taylor Mountain Roadless Area has a configuration which would lend itself to boundaries that could be managed for its undeveloped character.

This roadless area contains country that is steep and rugged. Valley bottoms are narrow and ridgetops are narrow and slightly rounded. Generally, the area is heavily timbered. The primary tree species are lodgepole pine and subalpine fir. Spruce occurs on the wetter sites; Douglas-fir and open sagebrush parks dominate many of the south slopes. Human influence on the area's natural integrity has been minor.

Extensive stringer meadows, riparian communities, and multi-storied forest complexes in the bottoms of all major drainages provide a series of diverse and productive habitats for a variety of bird and mammal species. The isolated character of these sites within the roadless area makes them particularly valuable as summer and fall security habitat for big game animals such as elk, moose, mule deer, black bear, and mountain lion, as well as other species that require large blocks of wildland country to prosper. Goshawks, great gray owls, and upland game birds such as spruce grouse and blue grouse can be found in the area; trout inhabit the larger streams.

There are many opportunities for primitive recreation within the boundaries of the roadless area, including hunting, hiking and horseback riding. Approximately 80 percent of current primitive recreation consists of elk hunting. Backpacking and hiking in areas other than maintained trails or alpine ridges is deterred by the presence of thick vegetation and heavy downfall in the region.

Motorized recreation is allowed under current management direction. Most of the motorized recreation which occurs within the roadless area is centered along the Moyer Peak jeep trail.

The Taylor Mountain Roadless Area is not considered outstanding for solitude opportunities because of its relatively small size and noticeable human activities along the edge of the area. This roadless area does have the general value wherein most people looking out from high vantage points could view landscapes with an appearance of relatively undisturbed terrain. Roads and timber harvesting units can be seen in the background from these higher elevation view points but they do not dominate the view scape. In the central portions of the area, at midslope, lower slope and streambottom positions, a person will experience a greater sense of remoteness. Foot travel is slow and difficult in these areas due to dense vegetation and rough terrain. In addition to the difficulty of travel, sight distances are restricted, often ranging from 30 to 100 yards. Travel by horseback or motorized vehicle is extremely difficult if not impossible in most of this area. These features help to promote a sense of remoteness.

Although much of the area in the Taylor Mountain Roadless Area has dense stands of timber with heavy downfall, there are portions of the area with a juxtaposition of meadows and timber that are common to the central-eastern Idaho portion of the Rockies. These are pleasant and scenic habitats that would be enjoyed by most individuals entering the area. One could imagine that the Salmon Mountains had this appearance when the area was inhabited by Native Americans before European explorers had entered this part of the world.

The more open habitats on some of the southern aspects give one a feeling of serenity and adventure as one walks across the hillside, expecting to see big game enjoying the benefits of meadow and forest cover.

The specific areas identified as being special to visitors of this roadless area are located in the vicinity of the Hat Creek Lakes, Taylor Mountain

Lookout, Opal Lake, Moyer Peak jeep trail (and unimproved campsites) and constructed trails. Iron Lake campground and the Iron Lake Road, although not within the roadless area boundary, were also identified as important recreational areas.

Iron Lake is not located inside the roadless area boundary but is surrounded by the roadless area. The Iron Lake Road (Road #020) intrudes approximately seven miles into the center of the Taylor Mountain Roadless Area. There is a developed campground with 8 units located on the lake shore. The 29 acre lake provides fishing and non-motorized boating opportunities for the users. The lake, campground and the forest road receive moderate use in the summer and fall months. The roadless character surrounding the road and the lake add to the sense of remoteness, apparent natural naturalness and natural integrity.

The Iron Lake campground is the main access point for the Hat Creek Lakes. The Hat Creek Lakes Trailhead (Trail # 093) is located on the edge of the campground, which also provides facilities for horse use. A three mile hike through glaciated basins and across open ridges will deliver the hiker or rider to a mountain basin with seven small lakes, four of which provide fishing opportunities. Unimproved camp sites can be found around the shores of these lakes where campers enjoy the forested spruce/fir habitats. The rocky ridges and peaks of Taylor Mountain and several surrounding mountains can be seen from forest openings. A visit to this basin can provide the forest user with a sense of satisfaction and contentment in enjoying the basics of life. Primitive recreation opportunities are plentiful in this area, and allow the user to experience the abundance of the areas natural integrity. Solitude may be compromised at times during the year when the recreation use is high.

The Moyer Peak jeep trail receives heavy motorized use during the big game hunting season. The jeep route lies on top of a major ridge and during dry weather can be traveled by a two-wheel drive vehicle. The topography along the jeep trail is relatively flat and unimproved hunting camps are established on many parts of the trail. Primitive recreation opportunities are limited on this jeep trail. Once the user leaves the jeep trail and travels cross-country the opportunity increases for recreation experiences with a high degree of personal challenge, since no maintained trails exist in this portion of the roadless area. As with the other mid-slope, lower slope and stream bottom positions in the roadless area, rough terrain and dense vegetation can make foot travel very difficult.

From forest openings on the Moyer ridge and associated northern ridges such as the Woodtick Creek drainage one can see evidence of human disturbance and hear the sounds of heavy equipment and vehicles on south-facing slopes two to three miles north. This reduces the opportunity for solitude on the north side of Moyer ridge, and decreases the apparent naturalness of the landscape north of Moyer ridge.

While the Taylor Mountain Roadless Area does not provide unique habitat to this region and is not the only roadless area in the vicinity, it is enjoyed and appreciated by National Forest users. In addition, some Forest Users have expressed ongoing concern of the cumulative effect of developing roadless areas.

Additional descriptions of the Taylor Mountain Roadless Area can be found in the Salmon Forest Plan Environmental Impact Statement, Volume 1, Appendix C. This document also details some of the past public comment on the preference to retain these areas as roadless and for their desirability as wilderness.

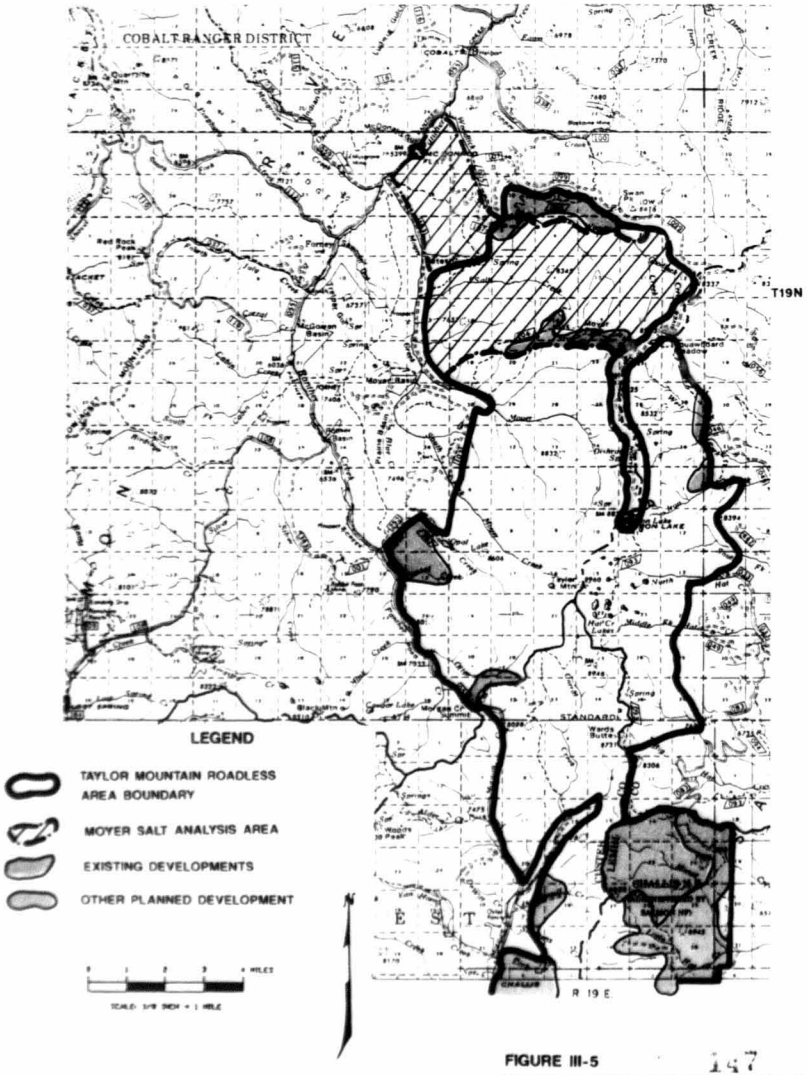


FIGURE III-5
TAYLOR MOUNTAIN ROADLESS AREA

VISUAL RESOURCES

Forest Plan Goals and Objectives

The general direction for the visual resource is to apply the Visual Management System to all National Forest System lands. Detailed standards and guidelines are found on pages IV-8 through IV-12 of the Forest Plan.

Affected Area

The affected area is the viewshed located in the Salt Creek, Moyer Creek and Woodtick Creek drainages.

Existing Condition

Views into the area from designated sensitive travel routes, identified below, are limited and are generally of the rounded, forested ridge tops. Views into the drainage bottoms are limited. The only prominent visual feature is Moyer Peak (9,085 ft. elevation).

The overall visual character of Moyer and Salt Creeks is of rounded ridges, deep valleys and a continuous canopy of lodgepole pine.

Principles and terms used in this section are taken from the publication, National Forest Landscape Management, Volume 2, Chapter 1, The Visual Management System, USDA Forest Service, Agriculture Handbook 462, April 1974. These terms are also defined in the glossary that accompanies this document.

The proposal area is bordered by three visually sensitive travel routes: Panther Creek Road (F.S. Road 055) (Sensitivity level 1), Moyer Creek Road (F.S. Road 103) (Sensitivity level 2), and the Salmon River Mountain Road ("Ridge Road") (F.S. Road 020) (Sensitivity level 2). Portions of the area are viewed as middleground and background from these routes. The remainder of the area is not visible from a designated travel route. The variety class is predominately Class B (common). These combinations result in Visual Quality Objectives of Partial Retention and Modification for the area.

A Visual Quality Objective of Partial Retention means that the management activity may be seen by the casual observer but the activity remains visually subordinate to the original characteristic landscape. The following proposed harvest units have a VQO of Partial Retention (see Figures II-1 to II-3 for location of cutting units): Units 3W, 4W, 11, 18, 19, 19A, 19B, 20, 22, 23, 25, S5, S6, S7, S12, S13, S14 and S15.

Under the Modification VQO management activities may visually dominate the original characteristic landscape, but the alteration must borrow from naturally established form and line to the extent and at such scale that its visual characteristics are those of natural occurrences within the surrounding character type. The following proposed harvest units have a VQO of Modification (see Figures II-1 to II-3): Units 1W, 2W, 7, 8, 9, 10, 13, 14, 16, 17, 21, 26, 27, 27A, 28, 28A, 29, 29A, 30, S11, S16, S17 and S18.

RECREATION RESOURCES

Forest Plan Goals and Objectives

The general direction for recreation is to provide a broad spectrum of dispersed recreation opportunities in accordance with the established Recreation Opportunity Spectrum (ROS) classifications for the management area.

Affected Area

The area affected by the proposed action is the analysis area defined in Chapter I and shown on Figure I-2, and is located in the Salt Creek, Moyer Creek and Woodtick Creek drainages.

Existing Condition

There are no system trails in the area. The Moyer Peak jeep trail, located along the south edge of the proposal area, is probably the heaviest used portion of the area. This jeep trail is also the probable location of the Thunder Mountain Trail, a historic mining trail used by gold miners to reach the Thunder Mountain Mine.

Current recreation use is considered light and is primarily related to big game hunting in the fall. The quality of the dispersed setting is high.

Current Recreation Opportunity Classes include Roaded-Natural Appearing, Semi-primitive Motorized and Semi-primitive Nonmotorized.

AIR QUALITY

Forest Plan Goals and Objectives

The goal for air quality on the Forest is to manage the Forest lands so that air quality will meet the National Clean Air Act and Idaho State clean air requirements for a Class II area. Specific requirements can be found in the USDA Forest Service/Idaho Dept. of Health and Welfare Division of Environment Memorandum of Understanding (February 5, 1988); Forest Service Manual Region 4 Supplement No. 75 (Title 2500 - Watershed and Air Management), April 28, 1990; and FSH 2509.19 Air Resource Management Handbook, August 26, 1987. In addition, the National Ambient Air Quality Standard (NAAQS) for particulate matter (PM-10) and the Prevention of Significant Deterioration (PSD) Total Suspended Particulate (TSP) increment for a Class II area must be met.

Affected Area

The affected area for the air quality resources for the proposed project is the analysis area and the airshed that surrounds it. The area that may be directly, indirectly, and cumulatively affected is the airshed (above and downwind of the analysis area) where burning and log hauling would occur. The local Salmon area may be affected depending on the burn intensity, time of year, inversions and wind patterns.

Existing Condition

All Salmon National Forest lands, including wilderness areas and the proposed timber sale area, are in a Class II airshed as designated by the 1977 Clean Air Act. The Class II designation allows moderate increases in new air pollution. Air quality in the analysis area is generally excellent and meets guidelines established by Idaho air quality laws and the National Clean Air Act. Air quality may be degraded and minor amounts of pollutants may occur from: 1) prescribed burning in the spring and fall by the Salmon National Forest and surrounding forests; 2) fire management fires burning in areas north of the Salmon National Forest; 3) dust from roads, logging operations, and mining operations; and 4) wildfires during forest fire season. These are generally of short duration, typically several days to several months in length.

Weather patterns affect the air quality, causing degradation when low pressure areas over Northern Utah and Southern Idaho pull suspended pollutants from large metropolitan airsheds in Utah and western Idaho, from farms (dust and smoke) in eastern Idaho, and from the dry deserts (dust) of Nevada, Utah and Idaho.

Baseline ambient air quality data is collected by the Salmon National Forest from an air monitoring site located on South Baldy Mountain (elevation 9,149 ft), located approximately 6 air miles southwest of Salmon, Idaho. The Moyer Salt timber sale analysis area is located approximately 16 miles southwest of the air monitoring site. Data collected at this site include particulate content (particles less than 10 microns in size) (PM-10 equivalent values) and air chemistry (University of California, 1989-1991).

The PM-10 equivalent values for the period from July 1, 1989 thru October 25, 1989 averaged 7.2 micrograms per cubic meter (ug/m3). This low value reflects the generally high air quality conditions that prevail in the area. The highest PM-10 equivalent value (40.2 ug/m3) was recorded on August 2, 1989. This high particulate reading was mainly due to a 890-acre lightning-caused fire burning about 15 miles west of the air monitoring site. Visibility at this same time was estimated to be less than five miles. The lowest PM-10 equivalent value (1.6 ug/m3) was recorded on August 26th during a rainy period.

The PM-10 equivalent values for the period from July 18, 1990 thru November 17, 1990 averaged 9.5 ug/m3. The highest PM-10 equivalent value (22.0 ug/m3) was recorded on October 17, 1990, during a prescribed fire on Lake Mountain, located about 6-8 miles southwest of the air monitoring site. The lowest PM-10 equivalent value (3.0 ug/m3) was recorded on August 18-22 during a period of rain.

PM-10 equivalent values for period from July 3, 1991 thru October 26, 1991 averaged 12 ug/m3. The highest PM-10 equivalent value (35.3 ug/m3) was recorded on October 16, 1991, during the Rush Creek Forest Fire in the Frank Church River of No Return Wilderness, near the Middle Fork of the Salmon River, and a forest fire in the Selway River area, both producing large amounts of smoke that accumulated over the Salmon area. The lowest PM-10 equivalent value (2.8 ug/m3) was recorded on October 9, 1991.

Under current Idaho State and Federal guidelines, air quality standards are being met in the analysis area.

RANGE RESOURCES

Forest Plan Goals and Objectives

The goal for range resources is to provide for the grazing of livestock; manage all allotments to maintain suitable rangelands that are presently in satisfactory condition, and to improve rangelands that are in poor or fair condition; and to control noxious weeds as needed to protect the value of other resources and to comply with State law.

Affected Area

The range allotments within the affected area are located in the Panther Creek and Moyer Creek drainages. The northernmost allotment is the Williams-Napias Creek C&H allotment, which extends west from the Forest boundary in the bottom of Williams Creek to the ridge dividing Panther Creek and the Salmon River, then south along the ridge road to China Spring, then southwest to Moyer Peak, then northwest to Panther Creek, then down Panther Creek to Fritzer Gulch, then up the ridge between Fritzer Gulch and Trail Creek to Jureano Lookout, then north to the head of Pine Creek, then southeast to Leesburg, then east to the ridge dividing Napias Creek and the Salmon River, then south along this divide to the ridge south of Pollard Canyon, then east down the ridge south of Chipps Creek to the Forest boundary, then following the Forest boundary to the point of origin. Forney C&H allotment adjoins the Williams-Napias allotment between Moyer Peak and Panther Creek. The Forney C&H allotment extends from the mouth of Moyer Creek up Musgrove Creek and then east to Quarzite Mountain, then south to the south fork of Cabin Creek, then east to Moyer Peak and northwest to the point of origin.

Existing Condition

Both the Williams-Napias and Forney range allotments are cattle allotments. The Williams-Napias allotment has 3 permittees and 668 cattle permitted for a season of 6/15 to 9/30. The Forney allotment has 2 permittees: one permittee is permitted for 164 cattle with a season of 6/02 to 10/02 and the other permittee is permitted for 120 cattle from 5/28 to 11/15.

These range allotments occur in mostly timbered sites with the bulk of the forage production occurring on transitory range such as previously harvested areas that now contain grasses, and in riparian ecosystems.

The range allotments have some fences, but the majority of the allotment boundaries are unfenced.

TRANSPORTATION AND ACCESS

Forest Plan Goals and Objectives

The goal for transportion and access is to develop and maintain a Forest transportation system that provides a safe, economical, functional, and environmentally sound access for managing and protecting the Forest resources.

Affected Area

The affected area for the transportation and access is the analysis area defined in Chapter I and in Figure I-2. This analysis only discusses roads that presently exist in the analysis area and roads that would be built under the different action alternatives. Transportation routes to and from the analysis area are not discussed.

Existing Condition

Approximately 85 percent of the analysis area is roadless and is therefore inaccessible by wheeled vehicles. The topography of much if the area is rugged, with steep-sided cirque basins and deep canyons. Soils in the area are stable quartzites/phyllites.

Existing roads located on the perimeter of the analysis area are mostly used for recreation and consist of 12 miles of maintained road and 5 miles of primitive jeep trail (F.S. Trail 6204, the Moyer Peak jeep trail) (Figure II-1). These roads are open year-round and all except the primitive jeep trail are maintained for recreation traffic. Because of the rugged topography in the area, these perimeter roads do not adequately serve the timber resource within the area. Existing timber access roads within the analysis area include 12 miles of timber access road and approximately 2 miles of old logging roads that are unsuitable for present use. These roads are gated and travel by the public is prohibited for all vehicles year-round for the purpose of big game security and erosion control (Salmon National Forest Travel Map, 1988).

MINERAL RESOURCES

Forest Plan Goals and Objectives

The goal for minerals is to encourage the exploration and extraction of leasable and locatable minerals from National Forest lands while maintaining or improving other resource values.

Affected Environment

The affected area for mineral resources is the analysis area defined in Chapter I and in Figure I-2.

Existing Condition

The potential for minerals development was assessed for both leasable minerals (oil, gas and coal) and locatable or hard rock minerals. The project area is located within the Blackbird cobalt-copper trend. Patented mining claims are located about 2.5 miles north of the northern boundary of the project area at the Blackbird Mine; in the Sawmill Gulch area less than one mile west of Moyer Creek; and in the Moyer Basin area. There are presently active mining claims in the analysis area, although no known mineral occurrences exist and there has been no mineral production from the area. Therefore, the potential for a locatable mineral discovery exists but no deposits occur in the area (Pers. Comm., Cobalt Minerals Forester, July 17, 1991). The geology of the area also suggests a low potential for oil, gas or coal development. Mineral development and associated vegetative disturbance and road building may therefore be spellnably foreseeable future activity in the study area.

CULTURAL RESOURCES

Forest Plan Goals and Objectives

The Forest Plan goal for cultural resources is to locate, determine the significance of and, where appropriate, preserve, protect, and interpret historic and archeological sites.

Affected Area

The affected area for cultural resources is the proposed area of direct impacts to the ground surface, such as the roads and cutting units defined for each alternative, as well as areas where access is increased due to construction of new roads.

Existing Condition

The Moyer Salt timber sale analysis area was partially inventoried for cultural resources in 1990 (Report # SL-90-685). No cultural resources were found during that survey, and cultural clearance was officially recommended for the inventoried areas. There are no known cultural resources located in or near the proposed roads and cutting units for Alternatives 2 and 3 (Ref. letter 2360,2430, dated May 8, 1991). The inventory for the proposed roads and cutting units for Alternative 4 was accepted by the State Historic Preservation Office on 8/18/92 as "no effect," since no historic properties were located. However, due to recent additions of cutting units and difficulties in correlating mapped with actual unit boundaries, small portions of units

19, S1, S2, S3, S5, S6, and S7 within Alternative 4 and units S12, S16, S15, S13, S6, 25, 26, 28 and 30 within Alternative 6 need to be inventoried. the added closure of the spur road just west of Moyer Peak in the SE1/4 NW1/4 of Section 16 will also need to be inventoried.

One historic site, the old Forney Telephone Line (site # SL-581), crosses an existing road in the vicinity of Swan Peak, where access to the eastern portion of the timber sales may be routed. This section of the phone line has been evaluated as not significant so it need not be avoided by project-related activities, and no further consideration need be given to it. Should additional segments of the phone line be discovered elsewhere in the project area, these would need to be recorded and evaluated on their own merits.

During the original analysis, it was determined that the area appeared to have a relatively low probability for significant cultural resource properties (Ref. letter 2360, 2430, dated January 31, 1991). The Forney Telephone Line is not eligible for the National Register and the Thunder Mountain Trail and Moyer Peak jeep trail are to the south of proposed impacts. The spur road which will be closed does not appear on any historic Forest maps nor are there any historic mining claims, homesteads, or developed recreation areas noted in the Forest Land Status Atlas that it would have service. Since both the closure and proposed units are on steep and rocky ground there is a very low potential of effecting a prehistoric or historic Native American traditional use site or archaeological site. Therefore, it is still the Forest Archaeologist's opinion that the road closure and proposed cutting units that have not been inventoried will have a low potential for adverse effect.

ECONOMIC EFFICIENCY

Forest Plan Goals and Objectives

Community stability is influenced through outputs from Forest lands that are related to timber, grazing, and recreation-related activites. The Forest Plan states that timber outputs will be provided at a level which will allow continuation of industries dependent on those outputs (Forest Plan, III-4).

Affected Area

The area affected by the economic efficiency of the proposed project includes the local zone of influence of the Salmon National Forest. This zone covers Lemhi and Custer Counties in eastern Idaho and Ravalli County in southwestern Montana. The residents and communities within this three-county area are influenced and affected by Salmon National Forest policies and decisions. The area includes six small towns: Hamilton and Darby, Montana, in Ravalli County; Challis and Mackay in Custer County, Idaho; and Salmon and Leadore, Idaho, in Lemhi County; and numerous small communities.

Existing Condition

The economic stability of communities in the Forest's primary zone of influence was an important issue in development of the Salmon Forest Plan. Because of the importance of this issue, the Forest Service sometimes offers timber sales that don't return the cost of selling and administering them. Concern has been raised that the proposed sale is not economically efficient and would not result in long-term positive cash flow. However, the economic efficiency of an alternative is not the only criteria used in selection of the preferred alternative. The Multiple Use, Sustained-Yield Act of 1960 mandates "coordinated management of the various resources with consideration given to the relative values of all the various resources... and not necessarily the combination of reources that gives the greatest dollar return or the greatest unit output."

An economic analysis was prepared for the Moyer Salt proposed alternatives using the Salmon National Forest's Timber Sale Program Information System (TSPIRS). Economic analysis evaluates the cost and benefits of the various proposed alternatives, including the no action alternative, to allow decision-makers to consider efficient methods of achieving objectives in the selection of an alternative.

Economic efficiency can be measured using the present net value (PNV) of the alternatives. This measurement is calculated using the MBF sold, post sale costs, road costs, bridge costs, cattleguard costs, and other costs associated with the sale.

Chapter IV

Environmental Consequences

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CHAPTER IV

ENVIRONMENTAL CONSEQUENCES

CHANGES BETWEEN THE DRAFT AND FINAL

1. Discussions of the effects for three additional alternatives, Alternatives 5, 6 and 2A, have been added.

2. Road density and results of sediment yield modeling discussion was added to the Hydrology section.

CHAPTER REVIEW

This chapter discloses the environmental consequences of implementing the alternatives proposed for this project. It describes the scientific and analytic basis for the comparisons of the seven alternatives; these comparisons are summarized in Table II-2 in this document. Whereas Chapter III describes the existing environment of the analysis area, this chapter describes the probable consequences, or effects, of each alternative on each of the resources. The resources are described in the same order in Chapter IV as they are in Chapter III. Resources linked to the issues described in Chapter I are described in detail; other resources are briefly discussed. All potential effects are described, including direct, indirect, short-term, long-term, beneficial, and adverse. The chapter also discusses the cumulative, or combined, effects of the alternatives along with past actions and reasonably foreseeable future actions. For this analysis, reasonably foreseeable future actions are limited to those that would occur during the present Forest planning period (to 1998); no additional timber harvesting is scheduled for the analysis area for this time frame, although TSI work will be performed that may involve some tree thinning.

All action alternatives propose varying intensities of timber harvesting and road construction that present a reasonable range of alternatives for implementing the proposed timber sale. Therefore, the environmental effects vary considerably in degree, but not in kind. The level of detail for each resource depends on the character of that resource and the scale of analysis most informative or relevant for the affected resource. Additional detail can be found in other documents referenced or tiered to by this Final EIS, in appendices, and in the project file.

The decisions that will draw upon the effects analysis for the proposed timber sale will be limited to the analysis area. The discussion for most resources was limited to the analysis area, but the possibility of cumulative effects on some resources promoted an analysis of a larger area.

SOILS EFFECTS

With implementation of the management requirements and mitigation measures outlined with the alternatives in Chapter II and in the Forest Plan standards and guidelines, the level of detrimental soil disturbance in all cutting units would be within Forest Plan standards (Forest Plan IV-59 through 61) and meet the desired future condition as directed. Also, long term soil productivity would be maintained for all treatment areas except for road surfaces. Roads would affect from 0.4 percent to 0.8 percent of the analysis area (see Table IV-1). Alternatives 4 and 6 would have the most effect on the soil resource because they would construct the most miles of road and harvest the most timber. Excluding Alternative 1, Alternative 5 is the least affected by roads.

This section will discuss the impacts to soils in terms of soil structure and movement, soil erosion, and soil productivity.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Direct effects include those activities that commit the land to uses other than growing vegetation for extended periods. Roads and any areas where soil compaction has not been mitigated would commit the soil resources to an essentially nonproductive condition for an extended time (50 years or more). These effects would be reduced by following the standards and guidelines in the Forest Plan and through mitigation measures (See Chapter II, Table II-1). The number of acres impacted would be minimized by using the roads as landing areas and using dedicated skid trails, particularly in areas with easily eroded soils.

TABLE IV-1: IMPACTS TO SOILS BY ALTERNATIVE

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
Existing Roads (mile/acres)	16.6/mi 57 acres	16.6/mi 57 acres	16.6/mi 57 acres	16.6/mi 57 acres	16.6/mi 57 acres	16.6/mi 57 acres	16.6/mi 57 acres
New Roads (mile/acres)	0 0	16.8/mi 62.1 ac	14.6/mi 55.2 ac	17.8/mi 66.1 ac	1.1/mi 4.0 ac	17.8/mi 66.1 ac	16.8/mi 62.1 ac
Total Soil Commitment due to Roads (acres)	57 ac	119 ac	111 ac	123 ac	61 ac	123 ac	119 ac
Percent of Analysis Area w/Total Commitment *	0.4%	0.8%	0.7%	0.8%	0.4%	0.8%	0.8%

* Total soil resource commitment occurs when the soil is committed to a use other than growing vegetation for an extended period of time; this typically occurs in roads, landing areas, and some skid trails.

Soil disturbance associated with timber harvest and road construction can also cause accelerated soil erosion and soil compaction. The rate that timber harvest accelerates soil erosion depends on the site conditions, the amount of disturbance, the rate of revegetation, and the climatic events that occur from the time of disturbance until the site is revegetated. Generally, accelerated erosion rates are highest immediately following soil disturbance. Reseeding of cut and fill slopes would be done the fall of the year the roads are constructed or, if the road construction is not complete in the fall, it would be done in early winter. Revegetation on fill slopes generally occurs within 1 to 2 years, and erosion rates return to their normal levels within 2 to 3 years. However, revegetation of the cut slopes may take much longer and vegetation may not be completely re-established due to the lack of topsoil, steepness of the slopes, or high percentages of bedrock. Therefore, long-term erosion effects may occur.

Potential indirect effects to soil resources include mass wasting, particularly of road cuts or fills. The triggering of mass failure is dependent on a variety of factors, including soil type, slope, subsurface water content, dip of bedrock, loss and decay of tree roots and other soil-holding capabilities due to timber harvesting, and climatic events. All of the proposed roads in the analysis area would be constructed on stable quartzite soils and associated landforms. These soils formed from quartzite bedrock, locally metamorphosed to phyllite, and typically have very good mass stability (see Chapter III, Soils) and thus a very low potential for mass wasting. Poorly constructed roads can potentially increase the risk of mass failure, and the potential increases with the miles of road constructed. The potential for mass failure can be reduced by the road's location, design, and drainage, and through management practices and mitigation measures such as those designed for this project (See Chapter II, Table II-1, and Appendix B).

A potential indirect impact to soil resources due to timber harvesting is soil displacement and compaction during harvesting. Skidding of logs may displace soil if the end is allowed to drag on the ground, and may also cause compaction of the underlying soil. Soil compaction may also occur in landing areas, in areas where heavy equipment is used, and on road surfaces with heavy traffic. The amount of soil compaction and displacement would vary by alternative with the amount of timber harvested. These impacts would be almost entirely mitigated through observance of best management practices during harvesting and by machine scarification and other post-harvest management practices. Helicopter harvesting would alleviate soil displacement and compaction within each harvest unit. Landing site impact would remain the same due to heavy equipment moving logs and hauling trucks.

Long-term soil productivity would not be affected by the proposed activities. Soil productivity is a function of an area's physical and climatic environment, which can be changed by loss of soil through erosion, creep, solifluction and mechanical displacement. These agents can be minimized through mitigation, logging unit layout, and road location.

Soil long-term productivity is also related to soil chemistry and structure, which affects the nutrient cycle, water movement and the living biotic component of the soil layers. Soil chemistry and structure are important and directly related to the amount of organic matter retained on a site. Current research indicates that large woody material should be left on the logging sites after they are logged and treated for seedling establishment (Harvey, 1987). Mitigations described in Chapter II of this EIS require that 10 to 15 tons of slash be left on the surface of the logging site. This large organic matter would provide the basics for chemical and structural soil development in the short and long-term future (Graham et al, 1991). Therefore, all of the alternatives would maintain the soil's short-term and long-term productivity as directed in the Forest Plan.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

Soil erosion would continue at it's natural rate on undisturbed land. The existing Moyer Peak Jeep Road would continue to produce soil erosion over time with the continued use of the road, but the potential to produce erosion is low due to the location of the road on a ridge. Existing timber access roads in the analysis area are gated and locked, and were designed and built in accordance with Forest Plan standards and guidelines. Erosion and sedimentation from these roads is minimal, and the mass erosion potential of these existing roads is low. No more roads would be built and no timber harvesting would occur. The total soil commitment would therefore be limited to the 57 acres already committed to roads. Because no additional acres would be disturbed by timber harvest or road construction or reconstruction, soil productivity would, in the absence of any wildfires or climatic events, remain at its current level.

Alternative 2

The specified new road construction of 16.8 miles would commit 62.1 acres of soil to an essentially nonproductive condition, in addition to the 57 acres already roaded (Table IV-1). The total soil resource commitment for this alternative would therefore be 119 acres, or 0.8 percent of the analysis area.

Alternative 3

The specified new road construction of 14.6 miles would commit 55.2 acres of soil to an essentially nonproductive condition, in addition to the 57 acres already roaded (Table IV-1). The total soil resource commitment for this alternative would therefore be 111 acres, or 0.7 percent of the analysis area.

This alternative would have the least amount of disturbance due to road construction of all the action alternatives. However, about 3,000 feet of new road construction would occur on the north side of Salt Creek in landtype Q120c, which is a warm to hot dry south aspect that receives approximately 25 inches of precipitation annually. Because of the south aspect of the area, it would be difficult to rehabilitate the cut and fill slopes. There would therefore be a greater risk of increased ero-

sion on this portion of the road and the amount of sediment reaching Salt Creek would be greater.

Alternative 4

The specified new road construction of 17.8 miles would commit 66.1 acres of soil to an essentially nonproductive condition, in addition to the 57 acres already roaded (Table IV-1). The total soil resource commitment for this alternative would therefore be 123 acres, or 0.8 percent of the analysis area.
This alternative would have the greatest amount of soil disturbance due to roading of all of the action alternatives, and thus would have the greatest potential of increased erosion and mass failure, and the most total soil resource commitment.

Alternative 5

The specified new road construction of 1.15 miles would commit 5 acres of soil to an essentially nonproductive condition, in addition to the 57 acres already roaded (Table IV-1). The total soil resource commitment for this alternative would therefore be 62 acres, or 0.40 percent of the analysis area. This alternative would be the least amount of soil disturbance due to raoding of all the action alternatives, and thus the least potential of increased erosion and mass failure, and the least total soil resource committment.

Alternative 6 PREFERRED

This alternative will have the same effects of soil impacted and displaced as Alternative 4 (see table IV-1).

Alternative 2A

This alternative has the same effects of soil impacted and displaced as alternative 2.

CUMULATIVE EFFECTS

Approximately 100 acres of post and pole sales and firewood and house log salvage would occur after timber harvesting, and minor impacts to the roads would occur, depending on local climatic conditions. No additional soil disturbance would be associated with these activities, and losses to soil productivity due to removal of trees would be within the standards and guidelines established by the Forest Plan. There are no additional surface disturbance activities proposed for the analysis area in the current planning period.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All the alternatives are consistent with Forest Plan standards and guidelines or the soil resource.

HYDROLOGY EFFECTS

Road construction and use and timber harvest may cause direct effects to water quality from accelerated erosion, particularly at stream crossings. Indirect effects to the hydrology of the area are those that do not immediately affect water quality, but may affect water quality in the long term, such as increased water yield and changes in the timing of peak flow due to timber harvesting.

Water Quality and Stream Sedimentation

The most prevalent cause of direct sediment introduction into streams from timber harvesting activities is road construction (Megahan, 1972). Lack of effective mitigation measures and poor road location lead to sediment being deposited directly in the stream. Sediment introduction from harvest units is generally minimal compared to that from roads.

No significant stream sedimentation is anticipated from the proposed action alternatives, except Alternative 3, due to the stable quartzite soils in the sale area, the use of filter strips adjacent to streams, and the development of site-specific Best Management Practices (BMP's), or mitigation measures.

Water Yield and Peak Flows

Total water yield and timing of peak flows are dependent on total precipitation and the snowmelt regime of an area. Much research has been done recently to determine the effect of vegetation removal on water regimes. These studies indicate that timber harvesting can cause an increase in the total water produced by a drainage due to a reduction of transpiration by removal of trees and an increase in the amount of snow reaching the ground due to reduced snow interception by the

tree cover and redistribution of snow during storms. Research done in Colorado in high elevation areas with similar precipitation patterns to those in the analysis area and a cold, dry snowpack has confirmed that timber harvesting can both increase and advance peak flows (Troendle and King, 1985). However, it has been generally noted that 20 to 30 percent of the watershed has to be harvested before a significant change in flow can be detected (Troendle and Leaf, 1980 as cited by Troendle, 1982). The observations in Little Woodtick Creek following the 1991 spring snowmelt runoff support the 20 to 30 percent rule of thumb. Twenty-three percent of this drainage was harvested, resulting in increased runoff and stream channel erosion (See discussion under Hydrology, Chapter III).

The percentages of drainages cut for all alternatives are shown in Table IV-2. The percentage of the drainages cut under all the action alternatives proposed are well below 20 percent. Peak flows

TABLE IV-2: PERCENT OF DRAINAGES HARVESTED IN THE MOYER SALT ANALYSIS AREA

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
Woodtick Creek Drainage							
Existing Harvesting (Tick Creek Timber Sale)	5.2	5.2	5.2	5.2	5.2	5.2	5.2
Proposed Harvesting	0	2.1	1.8	3.0	0.8	2.7	1.9
Total	5.2	7.3	7.0	8.2	6.0	7.9	7.1
Salt Creek Drainage	0	9.1	4.5	14.3	5.1	12.3	8.2
"Perm" Creek Drainage	0	11.3	11.3	14.2	4.3	13.1	10.4

therefore should not be increased to a point that channel erosion would result (Rosgen, 1978).

EFFECTS COMMON TO ALL ACTION

Effects Due to Timber Harvesting: With the proper utilization of adequate filter or buffer strips between the cutting units and the adjacent streams, there is a very low risk of sediment reaching either a perennial or intermittent stream. The Forest Plan contains guidelines for filter strip widths based upon geologic parent material, percent slope and percent ground cover (See Appendix B, BMP Summary). In addition, the Idaho Forestry Practices Act (IFPA) specifies a minimum Stream Protection Zone (SPZ) of 75 and 5 feet for Class I and Class II steams, respectively. To insure compliance with both the Forest Plan and IFPA, a minimum SPZ, or filter strip, of 75 feet would be used for all perennial streams. Where the Forest Plan recommends a filter strip greater that 75 feet this distance would be used. Field review of previous timber sales with similar soils and vegetation (Tick Creek and Perreau Creek Timber Sales) has shown that the current
guidelines for filter strips have been effective in preventing stream sedimentation.

With the application of the general BMP's for timber harvesting, the proposed timber harvesting for each action alternative would not have an adverse impact on water quality. The filter strips would ensure that sediment from the cutting units does not reach any intermittent or perennial streams. The fishery mitigation for maintenance of a minimum 75 foot uncut buffer on both sides of the perennial streams would ensure thermal cover for the streams so that water temperature and dissolved oxygen would not be adversely impacted. The existing beneficial water uses would not be adversely impacted in the short or long term from the proposed timber harvesting.

Effects Due to Road Construction and Reconstruction: In addition to the Soil and Water BMP's for road construction specified in the Forest Plan and

Idaho Forestry Practices regulations, site-specific BMP's have been developed for the proposed timber sale activities. Although the amount of new road construction varies for each alternative (Table IV-1), each action alternative, except Alternative 5, involves crossing Woodtick Creek, Goodluck Creek, Salt Creek, "Perm" Creek, and the unnamed drainage in the SE 1/4 of Section 10. Alternative 5 will not have any new stream crossings, but the existing stream crossing on Woodtick Creek will be reconstructed to improve fish passage. The locations of the stream crossings varies by alternative, and are discussed below under "Effects by Alternative". Site-specific BMP's for these crossings include placement of a slash windrow along the toe of the fill slope adjacent to these streams. Continuous windrows would extend out from the stream crossings until an adequate filter strip exists between the toe of the fill slope and the stream. The remainder of the road will also have a slash windrow for soil entrapment placed along the toe of the fill slope. However outside the filter strip short segments of the windrows will be removed at regular intervals for wildlife movement. The use of slash windrows on all the new road construction will greatly reduce soil movement downslope from the roads, and consequently stream sedimentation, except for Alternative 3. This mitigation measure would greatly minimize stream sedimentation associated with fill slope erosion.

Following sale closure and slash treatment, segments of the roads will have slash placed on them to prevent travel on the roads for protection of elk security areas. This will restrict road maintenance on these segments.

There is a possibility of blockage of the inside drainage ditches due to the slash placement and restricted road maintenance. This could result in road surface and fill slope erosion if water from the ditches runs across the road surface. To mitigate this potential impact these road segments will be surfaced with crushed gravel to a depth of four inches. In addition, supplemental fertilization of the reseeded areas will be done to ensure that a good stand of grass exists on the fill slopes before the slash is placed on the road. It is estimated that the slash will be placed on the road 3-5 years after the roads are constructed. This time lapse should allow for a good establishment of vegetation on the fill slope to protect it from surface erosion in the event of water running across the road and down the fill slope from a blocked drainage ditch. Though these segments will be impassable to vehicles they will be inspected annually to determine maintenance needs. Small ditch blockages will be cleaned by hand crews. Any large blockages that are observed will be evaluated as to their potential to cause surface erosion and fill slope failure. If a significant hazard is identified the slash will be removed from the road to allow equipment passage to correct the drainage problem.

Road construction should not have any long-term adverse sedimentation impacts on streams, except for the Salt Creek stream crossing in Alternative 3. The only anticipated impacts are short-term increases in water turbidity and minor localized stream sedimentation associated with the culvert installations. These negligible increases in sediment should not have an adverse effect on fish or fish habitat. The existing beneficial water uses - cold water biota, salmonid spawning, and secondary contact recreation - should be fully protected.

Monitoring of the Deep Creek watershed on the Cobalt Ranger District has shown that a watershed can be intensively managed for timber harvest and still meet the Forest Plan Standards for fine sediment in anadromous fish spawning habitat. The Deep Creek watershed which has stable quartzite soils, like those in the project area, has a road density of 1.7 mile/mile square and percent fines-by-depth in the spawning gravels of 14.4%. This value meets the Forest Plan objectives of less than 20% fine sediment for anadromous fish spawning habitat. The Deep Creek wateshed is similar to Woodtick Creek in that the majority of the roads are designed roads located primarily on the upper slopes of the watershed. Existing primitive roads are largely confined to the ridges where sediment delivery is minimal.

All of the proposed alternatives would result in a road density of 1.8 mile/square mile or less (Table IV-3), compared to 1.7 mile/square mile for the Deep Creek watershed. Road density is important in that roads are documented as primary sediment sources (Megahan, 1972).

TABLE IV-3: ROAD DENSITY

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6 PREFERRED	Alt 2A
Woodtick Creek Drainage (Mile/mile²)	1.4	1.8	1.7	1.8	1.5	1.8	1.8
Moyer Creek Drainage (Mile/mile²)	0.7	0.9	0.9	0.9	0.7	0.9	0.9

Sediment Yield Modeling: A sediment prediction model was run for all of the proposed alternatives to address water quality concerns relating to increases in stream sedimentation from timber harvest activities. The BOISED sediment prediction model was used for this analysis. BOISED was developed on the Boise National Forest and it is based on the conceptual model described in the publication entitled "Guide for Predicting Sediment Yields from Forested Watershed" published in October 1981 by the Northern and Intermountain Regions of the USDA Forest Service. The BOISED program is to be used as a tool to aid in predicting the cumulative yield of sediment from road construction, silvicultural activities, and fire within small forested watersheds (approximately 1 to 50 square miles). Model outputs are expressed as average annual sediment yields and sediment yields as a percent of natural sediment yields (% Over Natural). **The BOISED computer program is not intended to be a reliable prediction of absolute sediment quantities. Model outputs should only be used to compare alternative management scenarios.** Table IV-4 displays the results of the sediment modeling by watershed and alternatives. The results are addressed in the following discussion of each alternative.

Table IV-4: Sediment Yield Modeling Results

SEDIMENT AT CRITICAL REACH - WOODTICK CREEK

	ALT 1		ALT 2&2A		ALT 3		ALT 4&6		ALT 5	
YEAR	TOTAL (tons/yr)	% O.N. *	TOTAL (tons/yr	% O.N. *	TOTAL (tons/yr)	% O.N. *	TOTALS (tons/yr)	% O.N. *	TOTALS (tons/yr) *	% O.N.
1993	50	17	50	17	50	17	50	17	50	17
1994	50	17	112	160	119	177	116	169	59	37
1995	50	15	69	60	72	67	72	66	53	23
1996	49	15	58	35	61	41	62	43	52	20
1997	49	15	55	27	58	28	56	29	51	17
1998	49	14	53	23	52	22	53	22	50	16
1999	49	14	52	20	50	16	50	17	50	15
2000	49	14	51	19	50	16	50	15	49	14
2001	49	14	51	18	50	15	50	15	49	14
2002	49	14	51	18	50	15	50	15	49	14

SEDIMENT AT CRITICAL REACH - MOYER CREEK

	ALT 1		ALT 2&2A		ALT 3		ALT 4&6		ALT 5	
YEAR	TOTAL (tons/yr)	% O.N. *	TOTAL (tons/yr	% O.N. *	TOTAL (tons/yr)	% O.N. *	TOTALS (tons/yr)	% O.N. *	TOTALS (tons/yr) *	% O.N.
1993	127	23	127	23	127	23	127	23	127	23
1994	127	23	175	70	184	78	178	73	132	29
1995	127	23	141	37	144	40	143	38	129	25
1996	127	23	132	28	134	30	133	30	128	24
1997	127	23	130	27	131	27	131	27	127	23
1998	127	23	129	26	130	26	129	25	127	23
1999	127	23	128	25	128	25	128	24	127	23
2000	127	23	128	25	128	24	128	24	127	23
2001	127	23	128	24	128	24	128	24	127	23
2002	127	23	128	24	128	24	128	24	127	23

* % Over Natural

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

There would be no direct or indirect effect on water quality under this alternative as a result of additional timber harvesting activities. Stream sedimentation from channel erosion in Little Woodtick Creek will continue to occur until ground cover conditions in the upper watershed improve and logged areas are regenerated (see discussion under Hydrology, Chapter III). The effects of this stream sedimentation are localized and should not adversely impact beneficial water uses in Woodtick Creek.

Under the No Action Alternative there would be no additional effect on water yield from any of the drainages within the analysis area. The existing effect of increased water yield in the Little Woodtick Creek drainage will continue to occur until the area is regenerated and the trees grow to a size sufficient to offset the changes in snow accumulation and melt caused by timber harvest in the Tick Creek Timber Sale.

Sediment modeling results show that this alternative would result in the least amount of sediment generated. Sediment production in the Woodtick Creek drainage would start out at 17% over natural (O.N.) levels, as a result of the existing roads in the drainage and past timber harvest activities. This level would decline to 14% O.N. by 1998 and remain at this level through 2002, which is the end of the time period modeled (Table IV-4). Sediment production in the Moyer Creek drainage would start out at 23% O.N. levels and remain at this level through 2002.

Percent fines by depth measured in spawning habitat in Woodtick Creek should remain at or near the 15% level measured in 1992. This value meets the Forest Plan Standard of 20% or less fines in anadromous fish spawning habitat. No adverse impacts to water quality would occur under this alternative and the designated beneficial water uses would be protected.

Road density would remain at 1.4 miles/mile square in the Woodtick Creek drainage and .65 miles/mile square in the Moyer Creek drainage (Table IV-3).

Alternative 2

Under this alternative, 410 acres of of clearcut and 158 acres of shelterwood timber harvesting would occur. With the implementation of the BMP's described above, no adverse impacts are anticipated from timber harvesting.

Under this alternative 16.8 miles of new road construction is planned. Road density would increase to 1.8 miles/square mile in the Woodtick Creek drainage and to .9 mile/square mile in the Moyer Creek drainage. The major stream crossings include upper Woodtick Creek, Goodluck Creek, upper Salt Creek, and "Perm" Creek (Figure II-2, Chapter II). A slash windrow would be placed along the toe of the fill slope on all the new roads. This mitigation measure would greatly minimize stream sedimentation associated with fill slope erosion.

The effects on water yields and peak flow increases from the proposed timber harvest activities are expected to be within acceptable limits. Under this alternative 2.1 percent of the Woodtick Creek drainage, 9.1 percent of the Salt Creek drainage, and 11.3 percent of the "Perm" Creek drainage are proposed for timber harvest. This proposed harvest, in combination with the existing cutover areas (Tick Creek Timber Sale, 1988) in the Woodtick drainage, would increase the percentage of that drainage harvested to 7.3 percent.

The effects of this alternative on water yield and peak flow increases should be minor as the drainage percentages are well below 20 percent. Because no major increased peak flow is anticipated, channel erosion associated with inceases in peak flow should not occur.

Sediment modeling results show that this alternative would be in the middle of sediment production ranking. Sediment production in the Woodtick Creek drainage would start out at 17% over natural levels (O.N.) in 1992, increase to 160% O.N. in 1994 following road construction and timber harvest activites, and then sharply decrease to 23% O.N. by 1998. Sediment production in the Moyer Creek drainage would start out at 23% O.N. in 1992, increase to 70% O.N. in 1994, and then decrease to 26% O.N. by 1998 (Table IV-4).

Increased sediment production is not expected to exceed the streams capacity to transport sediment. Percent fines by depth are expected to remain below 20% in Woodtick Creek which would be below the Forest Plan standard of 20% or less fines-by-depth in anadromous fish spawning habitat (See discussion of Deep Creek Watershed under Effects Due to Road Construction and Reconstruction, Hydrology, Chapter 4). The only anticipated water quality impacts are short-term increases in water turbidity and localized stream sedimentation associated with culvert installations and road approaches to the stream crossings. These temporary increases in sediment will be minimized by the use of filter slash windrows along the toe of the fill slopes on the new roads. The existing beneficial water uses are expected to still be fully protected.

Alternative 3

Under this alternative, 270 acres of clearcut and 170 acres of shelterwood timber harvesting would occur. With implementation of the BMP's described above, no adverse impacts are anticipated from timber harvesting.

Under this alternative 14.6 miles of new road construction is planned. Road density would increase to 1.7 mile/square mile in the Woodtick Creek drainage and to .9 mile/square mile in the Moyer Creek drainage. The proposed major stream crossings would include upper Woodtick Creek, Goodluck Creek, lower Salt Creek and upper and lower "Perm" Creek (Figure II-3, Chapter II).

Except for the Salt Creek crossing, the new stream crossing locations are the same as Alternative 2. The Salt Creek crossing has been changed from a location in the headwaters of the drainage to a lower site where the stream flows through a steep, V-shaped valley bottom. Construction of a crossing in this location has a significantly greater potential for stream sedimentation than the Salt Creek crossing in Alternative 2. The steep sideslopes would result in long fill slopes immediately adjacent to the stream. The lack of slash and the slope steepness will also prohibit the construction of an effective slash windrow along the toe of the fill slope. In addition, the south facing sagebrush hillside adjacent to this crossing would be difficult to revegetate. Revegetation of this slope would take longer than the other crossings that are located in wetter, cooler micro-climates. As a result of these factors stream sedimentation is anticipated at the lower Salt Creek crossing. This effect would persist until the fill slope is revegetated.

Under this alternative there would also be reconstruction of the first eight miles of Road No. 107. The majority of this reconstruction would be minor. The major impact of the reconstruction would be the replacement of the culvert on Woodtick Creek with an open bottom arch or an oversized culvert to provide fish passage (see Fisheries Effects, this Chapter). Installation of an open bottom arch on larger streams, such as the lower Woodtick crossing, can result in increased water turbidity intermittently for periods up to two weeks.

Sediment modeling results show that this alternative would result in the most sediment production. Though actual miles of road construction and road densities would be slightly less than Alternatives 2,4, 6 and 2A the location of the roads lower on the slopes on more erosive landtypes results in greater sediment production for this alternative.

Sediment production in the Woodtick Creek drainage would start out at 17% over natural levels (O.N.) in 1992, increase to 177% O.N. in 1994 following sale implementation, and then sharply decrease to 22% O.N. by 1998. Sediment production in the Moyer Creek drainage would start out at 23% O.N. in 1992, increase to 78% O.N. in 1994 and then decrease to 26% O.N. by 1998 (Table IV-4).

Increased sediment production is not expected to exceed the streams capacity to transport sediment, **except for Salt Creek**. Percent fines by depth are expected to remain below 20% in Woodtick Creek which would be below the Foest Plan standard of 20% or less fines-by-depth in anadromous fish spawning habitat. (See discussion under Effects Due to Road Construction and Reconstruction, Hydrology, Chapter 4). The existing beneficial water uses are expected to still be fully protected in Woodtick Creek, Perm Creek and Moyer Creek.

The effects of the lower Salt Creek crossing will be the greatest. Because of the steep side slopes and the reduced potential for revegetation of this south-facing slope, stream sedimentation is anticipated in this location. This could cause some impairment of beneficial water uses in Salt Creek until the disturbed slopes are revegetated.

The effects on water yield and peak flow increases from the proposed timber harvest are expected to be within acceptable limits. Under this alternative, 1.8 percent of the Woodtick Creek drainage, 4.5 percent of the Salt Creek drainage, and 11.3 percent of the "Perm" Creek drainage are proposed for timber harvest. This alternative proposal, in combination with the existing cutover areas (Tick Creek Timber Sale, 1988) in the Woodtick drainage, would increase the percentage of the drainage harvested to 7 percent.

The effects of this alternative on water yield and peak flow increases should not be major as the drainage percentages are well below 20 percent. No channel erosion as a result of greater increased peak flow is anticipated.

Alternative 4

Under this alternative, 645 acres of clearcut and 202 acres of shelterwood timber harvesting would occur. With implementation of the BMP's described above and in Appendix B, no adverse impacts are anticipated.

Under this alternative 17.8 miles of new road construction is planned.
Road density would increase to 1.8 mile/square mile in the Woodtick Creek drainage and to .9 mile/square mile in the Moyer Creek drainage.
The proposed road locations and stream crossings for this alternative (shown in Figure II-4, Chapter II) are the same as Alternative 2 (shown in Figure II-2, Chapter II), except for a one mile spur off existing Road No. 107 in the Woodtick Creek drainage. This spur is located on the upper slopes of the drainage and would not cause any stream sedimentation. The effects of road construction under this alternative would be essentially the same as discussed under Alternative 2.

Sediment modeling results show that this alternative would produce slightly more sediment than Alternative 2, and slightly less than Alternative 3. Sediment production in the the Woodtick Creek drainage would start out at 17% over natural levels (O.N.) in 1992, increase to 169% O.N. in 1994 following sale implementation and then sharply decrease to 22% O.N. by 1998. Sediment production in the Moyer Creek drainage would start out at 23% O.N. in 1992, increase to 73% O.N. in 1994 and then decrease to 25% O.N. by 1998 (Table IV-4).

Increased sediment production is not expected to exceed the streams capacity to transport sediment. Percent fines by depth are expected to remain below 20% in Woodtick Creek which would be below the Forest Plan Standard of 20% or less fines by depth in anadromous fish spawning habitat. (See discussion under Effects Due to Road Construction and Reconstruction, Hydrology, Chapter 4). The only anticipated water quality impacts are short-term increases in water turbidity and localized stream sedimentation associated with culvert installations and road approaches to the stream crossings. These temporary increases in sediment will be minimized by the use of slash windrows along the toe of the fill slopes along the roads. The existing beneficial water uses are expected to still be fully protected.

The effects on water yield and peak flow increases from the proposed timber harvest, though greater under this alternative, are expected to be within acceptable limits. Under this alternative, 3.0 percent of the Woodtick Creek drainage, 14.3 percent of the Salt Creek drainage, and 14.2 percent of the "Perm" Creek drainage are proposed for timber harvest. This acreage, in combination with the cutover areas (Tick Creek Timber Sale, 1988) in the Woodtick Creek drainage, would increase the percentage of that drainage harvested to 8.2 percent.

The effects of water yield and peak flow increases, while greater in the "Perm" and Salt Creek drainages under this alternative, would not be major. The percentages of the drainages proposed for harvest are still below 20 percent. No channel erosion as a result of greatly increased peak flow is anticipated.

Alternative 5

Under this alternative 124 acres of clearcut and 168 acres of shelterwood timber harvesting would occur. This alternative would have the least amount of watershed disturbance of any of the action alternatives. Only 1.15 miles of new road would be constructed and 8.0 miles of road would be reconstructed. The majority of this reconstruction would be minor except for the replacement of the existing culvert on Woodtick Creek to improve fish passage during high flows. The new road construction is a short spur road that would be located on the upper slopes with no new stream crossings. Road density would increase to 1.5 mile/square mile in the Woodtick Creek drainage, but would not change in the Moyer Creek drainage.

Sediment modeling results show that this alternative would result in the least sediment production of all the action alternatives. Sediment production in the Woodtick Creek drainage would start out at 17% over natural levels (O.N.) in 1992, increase to 37% O.N. in 1994 following sale implementation, and then decrease to 16% O.N. in 1998. Sediment production in the Moyer Creek drainage would start out at 23% O.N. in 1992 increase to 29% O.N. in 1994 then decrease to 23% O.N. by 1998 (Table IV-4).

The minor increases in sediment production for this alternative would not exceed the streams capacity to transport the sediment. Percent fines-by-depth in the spawning habitat are expected to remain below 20% in Woodtick Creek which would be below the Forest Plan standard of 20% or less fines-by-depth in anadromous spawning habitat. (See discussion under Effects Due to Road Construction and Reconstruction, Hydrology, Chapter IV). The only anticipated water quality impacts are short term increases in turbidity and short term localized stream sedimentation associated with replacing the existing culvert on Woodtick Creek. Installation of an open bottom arch on larger streams, such as Woodtick Creek, can result in increased water turbidity intermittently for periods up to two weeks. The existing beneficial water uses are expected to be fully protected.

The effects on water yield and peak flow increases from the harvest proposed under this alternative are expected to be very minor. Cumulative harvest in the Woodtick Creek drainage would increase to 6.0% with the proposed harvest. A total of 5.1% of the Salt Creek drainage and 4.3% of the "Perm" Creek drainage would be harvested under this alternative. The percentage of the drainages proposed for harvest are well below the 20% threshold where changes in flow can possibly be detected. No channel erosion as a result of increased peak flows are anticipated.

Alternative 6 PREFERRED

Under this alternative 552 acres of clearcut and 202 acres of shelterwood timber harvesting would occur. New road construction would total 17.8 miles. The only difference between this alternative and Alternative 4 is the retention of unharvested islands in 15 of the proposed clearcut units. While this will result in a reduction of 64 acres of treated area the effects of this alternative are essentially

the same as Alternative 4 for the following reasons: 1) The road network would be exactly the same as Alternative 4; 2) Though uncut islands will be left in some of the clearcut units the skid trail density within these units would essentially be the same, resulting in approximately the same amount of surface disturbance. 3) The road densities and sediment yield modeling results are the same as Alternative 4. For these reasons the effects of this alternative are the same as discussed under Alternative 4.

Alternative 2A

Under this alternative 345 acres of clearcut and 158 acres of shelterwood timber harvesting would occur. New road construction would total 16.8 miles. The only difference between this alternative and Alternative 2 is the retention of unharvested islands in 21 of the proposed clearcut units. While this will result in a reduction of 84 acres of treated area the effects of this alternative are essentially the same as Alternative 2 for the following reasons: 1) The road network would be exactly the same as Alterntive 2. 2) Though uncut islands will be left in some of the clearcut units the skid trail density within these units would essentially be the same, resulting in approximately the same amount of surface disturbance. 3) The road densities and sediment yield modeling results are the same as Alternative 2. For these reasons the effects of this alternative are the same as discussed under Alternative 2.

CUMULATIVE EFFECTS

Future proposed activities within the analysis area include timber stand improvement (thinning) within the shelterwood units, post and pole harvest, firewood and house log salvage. No additional commercial sawlog timber sales are scheduled for the remainder of the current planning period, which extends through 1998. No additional roads are planned for construction for the post and pole or firewood harvesting. The effects of these proposed activities should be very minimal since no additional roads would be constructed and soil disturbance associated with these activities is negligible. The cumulative effects would essentially be the same as described under the Direct and Indirect Effects for the alternatives.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All of the proposed alternatives, except Alternative 3, are consistent with Forest Plan standards and guidelines for water. Alternative 3 could cause some impairment of beneficial water uses in Salt Creek until the disturbed areas are revegetated.

WETLANDS EFFECTS

The effects on wetlands from the proposed activites are expected to be very minor. A wetlands analysis was conducted to determine what the specific impacts would be for each alternative.

Normal silvicultural activities and the construction or maintenance of forest roads for timber harvesting purposes are exempt from the requirements of the 404 permit process (CFR 33, Part 323.4), providing that they are constructed and maintained in accordance with Best Mangement Practices. All of the roads proposed under the various alternatives are single purpose, silviculture roads that would be exempt from 404 permits. No Individual or Nationwide 404 Permits would be required for any of the proposed activites.

Direct and Indirect Effects from Timber Harvest

Alternatives 2, 4, 5, 6 and 2A: Isolated wetlands derived from springs or seeps are found at the lower boundary of Units 25 and S14. Limits of the wet area within the units will be flagged so that they can be avoided (See Wetland Mitigations). This would prevent surface disturbance of the wetlands.

Alternative 3: An isolated wetland derived from a spring or seep is found in Unit 25. Limits of the wet area within the unit will be flagged so that it can be avoided to mimimize surface disturbance of the wetland (See Water Mitigations).

Direct and Indirect Effects From Road Construction

During road location one primary objective was to avoid or minimize any adverse impacts to wetlands. An effort was made to locate stream crossings in reaches where the stream channels are well defined and the riparian wetlands are narrow. However, it was not always possible to locate the crossings in reaches where the wetland was narrow. Due to topographic features and grade constraints, some isolated wetlands derived from springs and seeps could not be avoided and will be crossed by the proposed roads.

Alternatives 2, 4, 5, 6, and 2A): Major stream crossings for these alternatives include Goodluck Creek, upper Woodtick Creek, upper Salt Creek and upper Perm Creek. The Woodtick and Goodluck Creek crossings are located just above the confluence of these two streams. The Salt Creek and Perm Creek crossings are located in the headwaters of these streams. All of these crossings are located in reaches where the stream is confined and only a stringer riparian spruce wetland adjacent to the stream is found.

Minor stream crossings include two forks of an unnamed tributary of Woodtick Creek (between proposed cutting Units 11 and 19) and crossings at the headwaters of five small tributaries of Salt Creek. Six of these seven tributary stream crossings are located where the riparian wetlands extend beyond the defined channel or draw bottom. The length of these wetlands at the point that they are crossed by the proposed road ranges from 75 to 400 feet. The size of the impacted (filled) wetland areas ranges from .03 acre to .18 acre. The most extensive wetland, which is approximately 400 wide, is located adjacent to a fork of an unnamed tributary of Woodtick Creek between Units #13 and #19. This spruce riparian wetland is found in a glacial moraine near the head of a cirque basin. This spruce wetland extended for at least one third of a mile above and below the proposed crossing so it was not possible to make minor alignment changes to avoid this wetland. An inside ditch and culverts will be constructed on the portions of the road that would cross these wetlands. This will allow any intercepted water to flow under the road and back into the downslope wetland.

The proposed roads would cross two isolated wetlands derived from springs or seeps. One is located just west of Unit 7 and one is located at the lower edge of Unit 25. These two isolated wetlands are approximately 150 feet and 100 feet wide and the impacted wetland areas will be .13 acre and .05 acre, respectively.

Alternative 3: The major stream crossings for this alternative include Goodluck Creek, upper Woodtick Creek, upper and lower Perm Creek and lower Salt Creek. The Woodtick and Goodluck Creek crossings are located just above the confluence of these two streams. The upper Perm Creek crossing is located in the headwaters of this drainage and the lower crossing is located approximately 1/3 mile downstream from the upper crossing. The lower Salt Creek crossing is located north of Unit #S12. All of these stream crossings would be located in reaches where the stream is confined and there is only a stringer riparian wetland adjacent the stream.

Minor stream crossings include two forks of an unnamed tributary of Woodtick Creek (between proposed Units #11 and #14). These stream crossings are also located in reaches where the streams are confined and there is only a stringer riparian spruce wetland adjacent to the stream.

The roads proposed for this alternative also would cross two isolated wetlands derived from springs and seeps. One wetland is located just west of Unit 7 and the other is located at the lower edge of Unit 25. These two isolated wetlands are approximately 150 feet and 100 feet wide and the impacted areas will be 0.13 acre and 0.05 acre, respectively.

CUMULATIVE EFFECTS

Future proposed activities within the analysis area include timber stand improvement (thinning) within the shelterwood units, post and pole harvest (approximately 100 acres) and firewood salvage. No additional commercial sawlog timber sales are scheduled for the remainder of the current planning period which extends through 1998. No additional roads are planned for construction for the post and pole or firewood harvesting. The effects of these proposed activities on wetlands would be negligible since no additional roads will be constructed and no additional fill will be placed in any wetlands. The cumulative effects would essentially be the same as described under the Direct and Indirect Effects for the various alternatives.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest Plan standards and guidelines for wetlands.

FISHERIES EFFECTS

A Biological Assessment was prepared for the DEIS which addressed the potential impacts of alternatives 1 through 4 on federally listed or proposed Threatened and Endangered aquatic vertebrate species (DEIS Appendix F).

A Biological Evaluation which addressed the potential impacts of these same alternatives on Forest Service Region 4 Sensitive aquatic vertebrate species was also prepared at that time (DEIS Appendix G). The Biological Eavaluation document was reformatted and updated in the FEIS to include three new alternatives not included within the DEIS (FEIS Appendix G).

Timber harvest and road construction have the potential to affect aquatic resources in several ways. Poorly designed and improperly mitigated forest transportation systems can affect both resident and anadromous fish habitat due to sediment being deposited directly in the stream (Yee and Roelofs, 1980). Improperly designed and installed road culverts associated with stream crossings can be barriers to fish migration due to outfall height, excessive water velocities, insufficient water depths, lack of resting pools, or combinations of these factors (Evans and Johnson, 1980; Yee and Roelofs, 1980). Proper design and installation criteria will be employed to ensure unrestricted fish passage opportunities when culverts are employed on streams containing fish populations. Riparian vegetation serves an important role in stabilizing banks, providing stream shade, contributing organic matter and terrestrial insects to the stream, and serving as a buffer against sediment transport into streams (Meehan et al, 1977; Yee and Roelofs, 1980). Improper timber harvest techniques which remove riparian vegetation or streamside shade trees can change water temperatures and adversely affect egg incubation (Greene, 1950; Chapman, 1962) as well as increase predation and reduce preferred juvenile salmonid microhabitats (Chapman, 1966; Allen, 1969).

Site-specific mitigation measures identified in Chapter II of this FEIS are designed to specifically address the potential sedimentation, migration, and riparian impacts of forest road construction and timber harvest activities identified above. Implementation of these measures, along with associated soil and water Best Management Practices (BMPs) are expected to minimize these potential impacts to aquatic habitats of the Woodtick and Moyer Creek drainage system. The effectiveness of these measures in protecting aquatic habitats would vary between alternatives, however, due to differences in road location and design, as well as site specific logistical constraints to full implementation of specified mitigation measures. These differing scenarios, in some instances, produce different risks of failure to adequately maintain one or more component of the aquatic environment. Where these differing effects occur, variations are discussed by alternative.

The anticipated effects of the various action alternatives discussed in the following section are based on the assumption that fish passage problems at the existing crossing of Woodtick Creek by F.S. Road 107 (Township 20 N, Range 19 E, Section 32)(Figure II-2) would be corrected if an action alternative were selected and would not be corrected under Alternative 1, the No Action Alternative.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Potential impacts to fisheries resources in the Woodtick and Moyer Creek drainages would be minimized through application of mitigation measures addressing stream sedimentation, fish migration, and riparian zone integrity (Chapter II, Table II-1). All action alternatives are expected to maintain fish migration opportunities and riparian zone integrity. The six action alternatives have differing effects upon potential stream sedimentation within the Salt Creek drainage, however. Effects to that stream habitat parameter, therefore, are discussed by alternative.

An existing culvert on FS Road 107 at Township 20 N, Range 19 E, Section 32 has become a high flow passage barrier to both resident and anadromous fish due to excessive water velocities. Although only four of the seven alternatives require reconstruction of this site as a component of their respective transportation packages, fish passage capabilities for existing upper-drainage bull trout populations and potential steelhead populations would be restored at this site under all action alternatives. Funding mechanisms to implement required reconstruction or replacement of this structure, however, would vary by alternative (see Fisheries Mitigations, Table II-1).

Reconstruction operations at this Woodtick Creek crossing would result in a temporary increase in water turbidity and the introduction of minor amounts of sediment to a localized area below the culvert site. Installation of this crossing structure in accordance with "Performance Criteria to be Observed to Protect Stream Channels" (FSM 2505.1-2, Appendix B) would minimize the spatial and temporal scope of these impacts.

All cutting units in the Woodtick, Goodluck, Salt, and "Perm" Creek drainages except units 26 through 30 in the "Perm" Creek drainage and unit 21 at the head of the Salt Creek Drainage are well removed from perennial streamcourses. Location of these units away from the streams would ensure surface interception of harvest/yarding-related sediment by intervening lands, maintenance of riparian vegetation integrity, and retention of thermal cover to aquatic environments. Those cutting units near perennial streams in the Salt and "Perm" Creek drainages would have filter strips 75 or more feet wide between perennial waters and the cutting units to preclude sediment introduction and maintain thermal stream cover, as prescribed by slope and vegetative cover criteria (BMPs, Appendix B).

Harvest operations would not be expected to greatly increase water yield within the Woodtick Creek drainage under any of the proposed action alternatives, as even the most intensive proposed cutting prescription would harvest only 3.0 percent of this basin (See Hydrology Effects, Table IV-4). Previous harvest within the Woodtick Creek drainage has impacted an additional 5.2 percent of this drainage, bringing the total affected drainage portion to 8.2 percent under maximum proposed harvest. This level of disturbance would be substantially below the 20 to 30 percent regarded as capable of producing greatly increased water yield (Troendle and Leaf, 1980, as cited by Troendle, 1982). Alternative-specific variations in cutting units and harvest prescriptions within the smaller Salt and "Perm" Creek drainages, however, have differing potentials to increase runoff flow intensities in these streams. Although no major land disturbing activities have been conducted in these drainage in recent years, various Moyer Salt harvest proposals encompass between 4.5 and 14.3 percent of the Salt Creek drainage and between 4.3 and 14.2 percent of the "Perm" Creek drainage. Potential effects to fisheries resources of varying harvest intensities in the Salt Creek and "Perm" Creek drainages, therefore, will be discussed by alternative.

All new specified roads constructed to access proposed cutting units are slated for year-round closure except during post-sale open-access firewood gathering periods (see Wildlife Mitigations, Table II-1). Long-term angler access to the mid and upper reaches of Woodtick Creek would therefore remain essentially unchanged under all action alternatives.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

No road construction or timber harvest activities would be implemented under this alternative. There would be no direct or indirect effects on fisheries resources within the analysis area due to activities associated with timber harvest. The aquatic habitats of Woodtick Creek, Goodluck Creek, Salt Creek, and "Perm" Creek would remain generally unchanged from conditions described in Chapter III, except for minor natural changes in channel structures related to continued introduction of large woody debris as trees die and fall down. Naturally-occurring events such as fire or floods may cause changes to fish habitat as a result of vegetation disturbance, increases in flow, or other events. Angler access and harvest of resident fish species in Woodtick Creek, Goodluck Creek, and Salt Creek would remain essentially unchanged from current levels. Future utilization of steelhead habitat within the Woodtick Creek drainage, and steelhead and chinook salmon habitat within the Moyer Creek drainage would be dependent upon improvement of water quality in Panther Creek. Under the No Action Alternative, the existing culvert at the crossing of Woodtick Creek by F.S. Road 107 in Township 20 N, Range 19 E, Section 32 (Figure II-1) would not be repaired or replaced through timber-related funding, because no revenue would be generated. It would continue to be a barrier to upstream migration of both anadromous and resident fish unless scheduled for repair or replacement via Fisheries Department project funding, by the Cobalt Ranger District.

Alternative 2

This alternative would require road crossings of Woodtick Creek, Goodluck Creek, Salt Creek, "Perm" Creek, and an unnamed tributary of Woodtick Creek. Fish passage at the existing road culvert on FS Road 107 (Township 20 N, Range 19 E, Section 32) would be restored in association with Knudson-Vandenberg (KV) funding, while construction design would maintain fish passage at the required new crossings of upper Woodtick Creek (Township 19 N, Range 19 E, Section 11) and Goodluck Creek (same legal)(Figure II-2). Under the transportation system associated with this alternative, the Salt Creek crossing would be located in the headwaters area of the drainage (Township 19 N, Range 19 E, Section 16)(Figure II-2). The natural diminished aquatic habitat capability at and above this location does not warrant a crossing design which would ensure fish passage at this site. A single crossing of "Perm Creek" would be required in Township 19 N, Range 19 E, Section 17 (Figure II-2) under this alternative. Fish passage capability would not be maintained at this crossing due to lack of aquatic habitat capability at and above this sites. A crossing structure would additionally be required across an unnamed tributary of Woodtick Creek (Township 19 N, Range 19 E, Section 10)(Figure II-2). Although this tributary is live at the proposed crossing location, it is intermittent throughout the majority of its length and is not believed to support fish life. Installation of standard culvert designs at the crossing locations of Salt Creek, "Perm" Creek, and the unnamed Woodtick Creek tributary would have no long-term impact on the fisheries resources of the Moyer or Woodtick Creek drainages. Adherence to Forest Plan standards and guidelines would minimize short-term sediment and turbidity-related impacts to downstream water quality during construction activities at all crossing locations.

BOISED modeling of the transportation system and harvest prescriptions associated with this alternative indicates that sediment delivery rates to Moyer Creek and Woodtick Creek would fall within the middle of the range predicted for the array of alternatives, being higher than the predicted rates for Alternatives 1 and 5, but lower than the rates predicted for Alternatives 3, 4, and 6 (Table IV-4). Mitigation measures identified in Chapter II, and applicable soil and water Best Management Practices (BMPs) are expected to be fully successful in protecting the aquatic habitats of these two drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of this document.

Timber harvest activities would impact 9.1 percent of the Salt Creek drainage and 11.3 percent of the "Perm" Creek drainage under this alternative. As these levels of basin harvest are well below the 20 to 30 percent basin harvest threshold levels observed to result in major changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982), no impacts to the natural flow regimes of these streams would be expected under this alternative.

Alternative 3

The transportation system for this alternative would require two crossings of "Perm" Creek rather than the single crossing required under Alternative 2. An upper crossing would be located in Township 19 N, Range 19 E, Section 17, as in Alternative 2, and a lower crossing would be located in Township 19 N, Range 19 E, Section 13 (Figure II-3). Fish passage would not be maintained at either of these two crossings, due to the lack of suitable fish habitat at and above these sites. Crossing locations of upper Woodtick Creek, Goodluck Creek, and the unnamed Woodtick Creek tributary would remain as described for Alternative 2, with fish passage capabilities being maintained at the upper Woodtick Creek and Goodluck Creek sites. Fish passage at the existing FS Road 107 culvert (Township 20 N, Range 19 E, Section 32, Figure II-3) would be restored in association with prescribed road reconstruction operations.

This alternative would additionally relocate the Salt Creek stream crossing to Township 19 N, Range 19 E, Section 7, and the crossing of the unnamed Woodtick Creek tributary to Township 19 N, Range 19 E, Section 10 (Figure II-3). Because it would be located in the middle reaches of the drainage, the Salt Creek stream crossing must be designed to ensure unrestricted fish passage under this alternative.

Culvert installation operations would temporarily increase water turbidities in Woodtick Creek, Goodluck Creek, the unnamed Woodtick Creek tributary, Salt Creek and "Perm" Creek at and below these crossing locations and may produce short-term sediment impacts to localized areas below these sites. Installation of these crossing structures in accordance with "Performance Criteria to be Observed to Protect Stream Channels" (FSM 2505.1-2, Appendix B) would minimize the spatial and temporal scope of installation impacts. The narrow valley bottom and steep sideslopes adjacent to the proposed Salt Creek crossing preclude flat, perpendicular approaches to this site, however. Further, these steep sideslopes inhibit the implementation of adequate soil and water mitigation measures between the road fill slope and the Salt Creek stream channel. These site specific limitations, coupled with the determitation of BOISED, which indicates that alternative would produce the greatest longterm sediment delivery rates of the seven alternatives analyzed, together produce an increased risk of surface erosion and consequently an associated increased risk of failure to continuously meet State water quality standards within Salt Creek stream channel (see Hydrology discussion, Chapter IV). As this crossing is located lower in the Salt Creek drainage than those proposed under other action alternatives, any long term stream sedimentation resulting from unchecked overland erosion would impact potential rearing habitats within that stream and, to a lesser degree, Moyer Creek below the confluence of Salt Creek.

Under this alternative timber harvest activities would impact 4.5 percent of the Salt Creek drainage and 11.3 percent of the "Perm" Creek drainage. This represents the lowest level of harvest within the Salt Creek drainage of the six alternatives considered. No impacts to the natural flow regimes of either Salt Creek or Woodtick Creek would be expected at these disturbance levels.

Alternative 4

The transportation system associated with this alternative utilizes the proposed extension of F.S. Road 106, as in Alternative 2, reconstruction of existing F.S. Road 107, and further extension of F.S. Road 107 one additional mile into the Woodtick Creek and Pete's Gulch drainages (Figure II-4). Stream crossing locations would be identical to those described for Alternative 2. Because the additional roading required under this alternative is located entirely on upper-slope portions of the Woodtick Creek and Pete's Gulch basins, no additional road-related impacts to aquatic resources would be anticipated from those described under Alternative 2.

BOISED modeling of the effects of the transportation system and harvest prescriptions associated with this alternative indicates that sediment delivery rates to Moyer Creek and Woodtick Creek would be the second highest of the seven alternatives analyzed. Mitigation measures identified in Chapter II, and applicable soil and water Best Management Practices (BMPs) are, however, expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of this document.

Timber harvest prescriptions are maximized under this alternative. Potential effects to fisheries are primarily related to possible increases in peak flow intensities resulting from intensive harvest of the Salt Creek and "Perm" Creek drainages. Proposed harvest operations under this alternative would encompass 14.3 percent of the Salt Creek drainage and 14.2 percent of the "Perm" Creek drainage. While the most intensive of the various harvest proposals, basin disturbance under this alternative would not approach threshold levels observed to result in major increases in annual water yield and peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982). As unmitigated potential sediment impacts to Salt Creek, "Perm" Creek, and Moyer Creek from increased peak flow intensity are not anticipated, implementation of this alternative would not be expected to adversely affect fisheries resources within the Moyer or Woodtick Creek drainage systems.

Alternative 5

This alternative requires the least new roadbuilding of the six action alternatives. Woodtick Creek would be the only stream crossed by the associated transportation system. Fish passage at the existing culvert at Township 20 N, Range 19 E, Section 32 (Figure II-5) would be restored in association with the required reconstruction of FS Road 107 associated with this alternative.

BOISED sediment modeling results for this combination of roads and cutting units indicate that this alternative would yield the second lowest amount of sediment to the Moyer Creek and Woodtick Creek drainages of the seven alternatives analyzed, and the lowest amount of sediment of the six action alternatives. Mitigation measures identified

in Chapter II, and applicable soil and water Best Management Practices (BMPs) are expected to be fully successful in protecting the aquatic habitats of these two drainages. Results and analysis of BOISED sediment modeling are discussed in greater detail within the Hydrology section of this document.

Under this alternative timber harvest activities would impact 5.1 percent of the Salt Creek drainage and 4.3 percent of the "Perm" Creek drainage. This represents the lowest level of harvest within the "Perm" Creek drainage and the second lowest level of harvest within the Salt Creek drainage of the six alternatives. No impacts to the natural flow regimes of these streams would be expected at these disturbance levels (Troendle and Leaf, 1980, as cited by Troendle, 1982).

Alternative 6 PREFERRED

The transportation system of this alternative is identical to that of Alternative 4. As sediment generated by road construction activities comprises the major component of overall yield, land disturbance reductions associated with the application of diversified forestry harvest strategies within units otherwise scheduled for clearcutting under Alternative 4 represents a relatively minor factor in the overall level of sediment generation under this alternative. The predicted BOISED sediment yield for this alternative, as a result, would be essentially the same as that generated under Alternative 4 (Table IV-4). As with Alternative 2, mitigation measures identified in Chapter II, and applicable soil and water Best Management Practices (BMPs), are therefore expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of this document.

Proposed harvest operations under this alternative would encompass 12.3 percent of the Salt Creek drainage and 13.1 percent of the "Perm" Creek drainage. Due to the reduction of harvest within 15 units otherwise slated for clearcutting, this alternative represents a 14.0 percent reduction in Salt Creek basin harvest, and a 7.8 percent reduction in "Perm" Creek basin harvest, relative to alternative 4. As with alternative 4, these levels of basin harvest, though among the highest of the alternatives considered, do not approach the threshold levels observed to result in major changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982).

Alternative 2A

The transportation system of this alternative is identical to that of Alternative 2. As with that alternative, fish passage at the existing road culvert on FS Road 107 (Township 20 N, Range 19 E, Section 32) would be restored through Knudson-Vandenberg (KV) funding, rather than in direct association with road reconstruction operations.

As indicated in the discussion for Alternative 6, sediment generated by road construction activities comprises the major component of overall sediment yield from timber sale activities. Land disturbance reductions associated with the application of diversified forestry harvest strategies within units otherwise scheduled for clearcutting under Alternative 4 therefore represents a relatively minor factor in the overall level of sediment generation under this alternative. The predicted BOISED sediment yield for this alternative, as a result, is essentially the same as that generated under Alternative 2 (Table IV-4). As with Alternative 2, mitigation measures identified in Chapter II, and applicable soil and water Best Management Practices (BMPs), are therefore expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of this document.

Proposed harvest operations under this alternative would encompass 8.2 percent of the Salt Creek drainage and 10.4 percent of the "Perm" Creek drainage. Due to the reduction of harvest within 21 units otherwise slated for clearcutting, this alternative represents a 9.9 percent reduction in Salt Creek basin harvest, and a 8.0 percent reduction in "Perm" Creek basin harvest, relative to Alternative 2. As with alternative 2, these levels of basin harvest are well below the threshold levels observed to result in major changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982).

CUMULATIVE EFFECTS

Harvest operations within the Woodtick Creek drainage associated with the 1988 Tick Creek Timber Sale have impacted 23 percent of the Little Woodtick Creek drainage. Post-sale field review of the area by the Forest Hydrologist in 1991 indicated that an increase in water yield directly attributable to intensive timber harvest had produced deleterious sedimentation in Little Woodtick Creek below the sale area (see Chapter III, Affected Environment, Hydrology). Sedimentation effects appeared to be confined to Little Woodtick Creek and were not believed to have impacted fish-bearing waters of mainstem Woodtick Creek. The increased water yield observed in Little Woodtick Creek as a result of intensive harvest within that drainage is not thought to have produced any measurable effects on the intensity or timing of peak flows in mainstem Woodtick Creek, due to dissimilarities in the timing of runoff in the two streams.

This 23 percent disturbance of the Little Woodtick Creek drainage corresponds to 5.2 percent of the total Woodtick Creek drainage. The various timber harvest prescriptions proposed under the Moyer Salt timber sale would impact an additional 1.8 to 3.0 percent of the total Woodtick Creek drainage, bringing cumulative land disturbance within the drainage to 7.0 to 8.2 percent. As this level of disturbance would be substantially below the 20 to 30 percent regarded as capable of producing greatly increased water yield (Troendle and Leaf, 1980, as cited by Troendle, 1982), no further fisheries impacts related to cumulative land disturbance in the Woodtick Creek drainage would be anticipated under any of the proposed Moyer Salt action alternatives.

Reasonably foreseeable future activities within the analysis area include timber stand improvement (TSI) operations within all shelterwood units, post and pole sales, and public firewood salvage. No additional road construction would be needed to implement these post-sale activities, and no new commercial sawtimber sales are proposed within the analysis area within the current planning period. Consequently, cumulative impacts to aquatic habitats encompassing post-sale activities would be limited to those described in the preceding sections. Only a very minor and short-lived increase in consumptive harvest of resident fish would be expected in association with open-access public firewood gathering in the Woodtick Creek area.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives except Alternative 3 are expected to provide a level of fish habitat protection consistent with Forest Plan guidelines of providing for maintenance of State water quality goals and retention of spawning and rearing habitats for resident and anadromous species at 90 percent of inherent potential. Alternative 3 exhibits an high inherent risk of failure to meet water quality standards, due to the site specific inability to adequately protect water quality and stream substrates in the vicinity of the proposed Salt Creek crossing site. Additionally, Alternative 1, the no action alternative, is not consistent with Forest Plan guidelines because under this alternative the current fish passage problem on Woodtick Creek would most likely continue. No funding mechanisms to correct it would be implemented under this alternative. This barrier could be corrected at another time.

EFFECTS TO BIOLOGICAL DIVERSITY

Effects of the Proposal

A complete analysis of the effects of the proposed alternatives for this timber sale on biological diversity and related topics are contained elsewhere in this document [see Biological Diversity (Appendix H, Section II), Wildlife and Fisheries Section of this chapter and the Biological Evaluations (Appendix G) and Assessments (Appendix F] of the FEIS. A short synopsis of the most significant of those findings is provided here.

Changes in diversity due to changes in plant communities:

The Moyer Salt Timber sale area is located in Douglas-fir communities at mid-slope and lodgepole pine and subalpine fir communities at upper slope positions in the Moyer Salt Landscape. The largest of the proposed harvest alternatives will occur on approximately 2% of the Moyer Salt Landscape. All of the action alternatives will harvest trees in mature and immature Douglas-fir, mature and immature mixed conifer and lodgepole pine, and pole-sized mixed conifer stands.

Areas that the alternatives would clearcut harvest trees on would increase the amount of seedling/sapling habitat in patches up to 40 acres. Areas that the alternatives would employ the shelterwood and irregular shelterwood harvest technique on would produce scattered seedling/sapling habitat in small patches throughout larger treatment units (up to 95 acres). This should result in the establishment of plant and animal associations similar to those found in mature Douglas-fir communities after a low to moderate intensity fire has occurred.

The ecological result of these two techniques is that the clearcuts would produce habitat markedly different in plant structure and animal composition than found in the current existing condition or in the surrounding area. In addition, the "edge effect" produced would be greatest where the clearcut harvest technique is used. There would be a marked increase in grass and forbs in these units and "pioneering" animals like, white-footed deer mice, least chipmunks, chipping sparrows, and red-tailed hawks would increase. All of these species are already relatively abundant because they are adapted to a wide range of habitats and plant communities that are quite common.

The irregular shelterwood harvest technique will support plant and animal communities more like those existing in the landscape today. As a result, the contrast between harvest units and the habitat surrounding the harvest units will be less. Therefore, the "edge-effect" will be less pronounced than would occur with other harvest techniques. Species which occur in Douglas-fir habitats of the age proposed for harvest in the Moyer Salt timber sale include: hermit thrushes, western tanagers, pine marten, red-backed voles, and red squirrels. These species are abundant only where native mature and old conifer trees occur.

Species which depend on mature to old growth stands with closed canopies, for instance goshawks which nest in such stands, will not be able to use harvest units until the stands mature. However, these harvest units will develop old growth characteristics more quickly than units that have been clearcut.

Effects on travel corridors:

All of the action alternatives, except the helicopter alternative (Alternative 5), would facilitate movement of humans and some plants and animals between the Moyer Salt Landscape and the adjacent eastern landscape, Iron Lake Landscape (see Figure III-2 Landscape Boundary Map) because of the road corridor connecting the two. In addition to resident mid- to big-sized animals, rare species like wolves, wolverines and lynx could also use this travel corridor. The permanent roads proposed in all but the helicopter alternative would result in a loss of small areas of terrestrial and aquatic habitat.

The alternatives proposing the use of clearcut with islands, shelterwood and irregular shelterwood harvest technique would produce plant communities that more closely resemble the surrounding plant communities, thus leaving some cover. It is thought that these units will disrupt the movement of animals through harvest areas less than units which are clearcut. However, even under the alternatives that propose only the clearcutting technique of harvest, the forested corridor would not be completely severed. In fact most of the forested cover would still remain even for Alternative 4, which would clearcut the most area (645 acres) and only results in removing cover from approximately 2% of the entire Moyer Salt Landscape.

Unique habitats:

Old growth habitat will be reduced by all of the action alternatives in this proposal. Under Alternative 4, which harvests the most old growth, there would be a 15% reduction of acres which have old growth characteristics in the Woodtick and Salt Creek drainages, other drainages in the Moyer Salt Landscape would not be affected. No old growth protection stands (see Figure III-3, Old Growth Retention Areas) would be harvested. Alternatives which propose clearcutting would result in harvest units that will not have mature to old conifers, or the animals associated with them, for over 120 years. However, for the areas that alternatives propose harvesting trees by the shelterwood or even more so by the irregular shelterwood technique, some old growth characteristics (large old trees, snags and downed logs) will remain after harvest. It is expected that the animal and plant communities which would use these units would more closely resemble those found in mature to old Douglas-fir stands elsewhere in the landscape.

Because harvest units are located well away from wetlands, riparian corridors would only be affected

by the proposed alternatives under which roads are constructed across creeks. Mitigations which address disturbance and recovery of riparian areas at the proposed road crossing are included in all alternatives. None the less, at each crossing a permanent loss of small areas of wetland will occur. The Preferred Alternative (Alternative 6), would effect approximately 3 acres of wetlands. The helicopter alternative would have no effect on wetlands.

Effects on rare species:

The National Forest Management Act of 1976 directs the USFS to provide for the maintenance of viable populations of native and desired non-native vertebrate species and the recovery of listed species. The effects of Forest management activities on TEPS species are evaluated by how the activity might change the viability of the species on the Salmon National Forest. Viability in this sense means the probability that the species will continue to exist on the Forest. The Biological Evaluation and Assessment for TEPS which occur on the Salmon National Forest indicate that the management activities proposed for the Moyer Salt Landscape will not adversely affect the viability of species indigenous to the Salmon National Forest.

VEGETATION EFFECTS

Timber management activities directly and indirectly affect the vegetative diversity and the timber resources of the analysis area by modifying components such as the species abundance and distribution; structural and age diversity; and the overall health of the forest, including insect and disease infestation and the potential for wildfires.

All action alternatives propose use of the shelterwood and clearcut silvicultural systems or modifications of those systems. Prescribed treatments are the same for Alternatives 2, 3, and 4. Initial effects to vegetation would be similar for these alternatives. Effects to vegetation would vary slightly for Alternatives 5, 6, and 2A due to helicopter logging (Alternative 5) and leaving islands in the clearcuts (Alternatives 6 and 2A). The main differences between all alternatives are the size and location of the cutting units, and the number of acres harvested. These factors directly affect the relative ability to improve growth, health, and vigor of timber stands through implementation of silvicultural treatments. Where the visual quality objective is partial retention, many of the clearcuts will be limited to 15 acres in size while shelterwood units may be limited to 25 acres in size. In addition, removal of adjacent stands (leave strips) would be delayed until the first entry units have regenerated to an average height of 22-25 feet. Please refer to EFFECTS BY ALTERNATIVE in this chapter for a detailed description of the effects by alternative.

Changes in the vegetative characteristics in the analysis area due to implementation of the alternatives are described in this section. Changes in vegetative diversity are discussed in terms of changes to forest succession, species abundance and distribution, and stand structure. Changes to the timber resource are discussed in terms of changes to the age class distribution of the forest, effects to insect and disease susceptibility, effects to noxious weeds, and fire management.

EFFECTS TO VEGETATIVE DIVERSITY

Changes to the vegetative diversity in the Moyer Salt analysis area would occur under the no action alternative (Alternative 1) and under all of the action alternatives. If no timber harvesting or natural events that would disrupt the stands were to take place, the trees in the area would continue to age and die, and the species composition of the stands would slowly change. As trees in the overstory die and fall down, more shade-tolerant trees in the understory would become the dominant tree species on the site. Changes would also occur in the understory structure and in the distribution and abundance of other understory species.

The timber harvest activities proposed for the action alternatives would change the existing vegetative diversity. Older trees would be cut and the harvested stand would be replaced by a stand of young trees that have a different structure and that may have a different species mixture than the existing stand. Stands would be regenerated naturally from trees left on the site or from trees in neighboring stands. Seeding of shrubs, grasses, forbs, and other plant species would occur from neighboring stands or would be carried to the site by wind, birds, and other sources. Sprouting from roots of plants already present on the site would also occur. In the unlikely event that natural regeneration fails, the stand would be planted with

seedlings grown from local seed sources. The genetic diversity of plants and trees would be maintained by these events.

The even-aged silvicultural system and the clearcut and shelterwood cutting methods proposed for the Moyer Salt Timber Sale were selected as the preferred harvesting methods because not only are they environmentally sound and economically efficient but they reproduce the natural events that would occur in the area. The present condition of the forest communities on the site are the product, in part, of the fire history of the area. Lodgepole pine, the dominant tree species in the area, is a fire-dependent species. Where the natural fire cycle has been interrupted by fire suppression activities, these trees are no longer growing or are dying.

Habitat Types

Habitat types are a permanent measure of the potential climax vegetation which occurs on a site and the site potential. Thus, no alternatives would change the habitat types. The different harvest treatments would, however, change the successional stage of a particular habitat type. Even-aged harvest methods, including clearcutting and modified shelterwood cutting, would return the stand to an earlier successional stage (see the following section on successional stages for more discussion). Each action alternative harvests approximately the same percent of each habitat type. However, all action alternatives cut more of the subalpine fir habitat series than the Douglas-fir habitat series.

No unique or special habitat types would be harvested under any of the action alternatives.

Forest Succession

For the no action alternative as well as for all areas not proposed for timber harvest, changes to forest succession will slowly occur in the absence of any major vegetation disturbing events. Mixed conifer stands on the subalpine fir habitat types are in late successional stages. Here the seral species are dying out and being replaced by the climax species of subalpine fir. The subalpine fir habitat types that are occupied solely by lodgepole pine are in an earlier successional stage but will eventually evolve into a climax stage. The Douglas-fir habitat types that are occupied by Douglas fir trees are in a late successional or climax stage.

All action alternatives would alter the existing successional stages in areas that are cut. The even-aged harvest treatments proposed for all of the action alternatives would change the successional stage of the areas cut from mid or late-successional stages to an early successional stage. These changes in successional stage will vary with habitat type; in some habitat types not only will the age and condition class change with harvesting, but the dominant trees species on the site will also change. For example, the mixed conifer stands on the subalpine fir habitat types are nearing climax and are presently occupied by timber stands with an overstory composed of roughly equal amounts of lodgepole pine and subalpine fir with minor amounts of Douglas-fir and Englemann spruce. After harvest, the stands that reforest the site will, depending on seed sources, post harvest treatments, and other factors, be dominated by the seral species, lodgepole pine (greater amounts of Engelmann spruce and subalpine fir could be expected in clearcuts where uncut islands are retained - Alternatives 6 and 2A).

On Douglas-fir habitat types that are currently occupied by Douglas-fir with minor logepole pine and subalpine fir, the trees that reforest the site would be comprised of mostly Douglas-fir with variable amounts of lodgepole pine, depending on seed source. Where machine scarification and slash piling is infeasible due to lack of road access (Alternative 5 - helicopter yarding), pinegrass will be expected to increase following harvest eventually forming a dense sod. The establishment of this sod could delay regeneration for 20 years or longer. Regeneration that does become established would be comprised of a higher percentage of Douglas-fir than where scarification was performed.

Condition Class

All action alternatives would change the age and condition class of the harvested units. Stands that are currently mature and overmature would be converted to a younger grass/forb/shrub condition class. On sites where the younger trees are retained, such as the shelterwood units that will have an overstory removal cut, the condition class will be converted to a seedling/sapling or pole class, depending on the age and size of the trees that are

retained. Shelterwood sites with leave trees would have a multi-story structure for several years after harvest; these areas would contain a grass/forb/shrub condition class interspersed with mature trees.

EFFECTS TO SPECIES AND STRUCTURAL DIVERSITY

Species Diversity

Timber harvest would change the abundance and distribution of tree species within the analysis area. As discussed above, the stands that regenerate within the harvested units would have a different species composition than those that are growing on the site at present, depending on the successional stage and habitat type present on the site. In addition, the vegetation that would grow on the harvested sites would include pioneer species such as fireweed and species that are adapted to open environments. New growth that occurs would contain a higher percentage of grasses, forbs and shrubs than existing stands. Seeding of road surfaces and cut and fill slopes for erosion control could also slightly change the grass and forb species composition. Persistence of existing plant species and other biota would depend on site preparation and other management activities as well as the species' adaptability to an open environment. Grasses, forbs and shrubs in the understory would be exposed to increased light and available moisture with removal or partial removal of the overstory. Species abundance and distribution could also change if post-harvest stand management selects one tree species over another.

These changes to plant species and abundance would not only affect the vegetation resource but would favor wildlife that are adapted to a more open habitat. Many plant species that are important big-game forage would be favored.

Lodgepole pine would generally be managed for on subalpine fir habitat types currently supporting the lodgepole pine/mixed conifer stands described in Chapter III. Regenerated clearcut units would contain a higher percentage of lodgepole pine than present mixed conifer stands. However, where subalpine fir or Engelmann spruce occur naturally in the regenerated stand, they would be retained to maintain species diversity. Large-diameter live Douglas-fir and subalpine fir retained in the units as recruitment snags would contribute to species diversity and provide a seed source for regenerating those species.

Shelterwood harvest units would have the same approximate species composition that is present in current stand conditions, with a possible slight increase in the amount of lodgepole pine.

In general, changes in species composition of the analysis area as a whole would be small because of the large size of the project area and the relatively small acreage of ground-disturbing activities proposed.

Structural Diversity

Structural diversity would be affected primarily within timber harvest units, which make up between 1.9 and 5.5 percent of the analysis area (Table IV-5). The remaining 94-98% of the analysis area would continue to have structural diversity provided by riparian areas, natural openings, old growth retention stands, stands unsuitable for timber management, and inaccessible areas.

The proposed shelterwood and clearcutting harvest methods create even-aged timber stands. If they develop uniformly they would be less structurally diverse than the existing uneven-aged stands that occur within the analysis area that have a mix of canopy layers and an abundance of snags and downed logs.

Vertical diversity within clearcut units would be greatly reduced following timber harvest. Existing snags and recruitment snags would be maintained within harvest units in accordance with Forest Plan direction, thereby maintaining some vertical diversity (Alternatives 2, 3, 4, 5,). Clearcuts that contain uncut islands (Alternatives 6 and 2A) would provide greater vertical diversity than those where only snags or retention trees are left. Some structural diversity would also be provided by maintaining 10-15 tons per acre of large woody debris. From a landscape perspective the regenerated clearcuts would eventually form a mosaic of relatively even-aged stands that follow natural patterns and avoid geometric shapes. As the regenerated stands grow in height they would take on an appearance similar to the even-aged pole-sized lodgepole pine stands described in Chapter III. Post-sale timber stand improvement activities such as thinning and removal of dead and dam-

aged trees would occur in the regenerated stands at a relatively young age in order to maintain tree and stand vigor. As a result, these stands would have a more "open grown" appearance than the fire regenerated stands.

The extent to which vertical diversity would be modified in the shelterwood units would directly correlate with natural stand conditions (the presence of existing regeneration) and the variation of shelterwood method used i.e. standard shelterwood vs. group shelterwood. Where the standard shelterwood is employed approximately 12 to 27 trees per acre of the healthiest dominant and co-dominant trees would be left to shelter the site and produce new seedlings (within 10 to 15 years). Once the seedlings are established, the majority of the remaining overstory would be removed leaving 3-5 large diameter trees for us by raptor and cavity nesters. Thus vertical diversity in this stand condition is relatively low consisting of primarily Douglas-fir seedlings overtopped by a few old growth trees.

Vertical diversity is essentially maximized in both the group and irregular shelterwood methods. Stands treated using these methods will be composed of four age structures in small, even-aged groups. For example, following the removal cut of the shelterwood the stand would have four vertical components: 1) regeneration less than three feet tall as a result of the shelterwood seed cut; 2) existing Douglas-fir saplings 10-15 feet tall which released after the first entry; 3) existing pole-sized and immature sawtimber which released after the first entry; and 4) large diameter snags and recruitment snags left in accordance with Forest Plan direction of the shelterwood would be made leaving three to five large trees per acre for snag replacement or future harvest.

In stands where there are healthy young trees on the site that will grow if competing trees are removed, a group shelterwood method would be implemented (designated as group shelterwood on the stand maps). When this method is proposed it is characterized by three distinct components: 1) a Douglas-fir overstory with an understory of Douglas-fir seedlings and saplings ranging from two to six feet tall; 2) a Douglas-fir overstory with an occasional clump of regeneration but generally park-like in appearance; 3) thick patches of advanced Douglas-fir regeneration (pole size material 3.0 to 8.9 inches DBH. These three components create a mosaic of even-aged groups.

The objective of the group shelterwood method is to maintain these components as even-aged groups, thereby replicating nature's reproduction system. In the initial entry, this method takes advantage of the existing regeneration where a suitable understory is present. The removal cut of the shelterwood would be performed to release existing regeneration. Where regeneration is lacking the seed cut, a shelterwood would be implemented removing approximately 50 to 70 percent of the overstory depending on site conditions.

The remaining "leave trees" would be expected to regenerate the unstocked openings within 10 to 15 years. Once regeneration was established, a removal out of the shelterwood would be made leaving three to five large trees per acre for snag replacement trees.

Shelterwood Harvest (Alternatives 5, 6 and 2A) In order to meet visual quality objectives and mitigate other resource concerns, many of the units in Alternatives 5, 6, and 2A will be treated utilizing a modified irregular shelterwood system (designated irregular shelterwood on the alternative maps). This method would be initially similar to the standard and group shelterwood methods described for Alternatives 2, 3 and 4. The primary difference is that the shelterwood trees are retained longer than necessary for seedling establishment thus delaying the timing of the second entry into the stand. The removal cut (second entry) of the shelterwood would not be performed until the average height of the regeneration is approximately 20 feet. The removal cut would therefore occur approximately 20 to 30 years after the seed cut as compared to 10 to 15 years when employing the standard or group shelterwood.

EFFECTS TO THE TIMBER RESOURCE

Effects to the timber resource are discussed in this section in terms of changes to the age-class distribution, growth and yield, insect and disease infestation, potential for noxious weed invasion, and fire management.

Timber management activities directly and indirectly affect the timber resources of the analysis area by modifying components such as the species abundance and distribution; age-class

distribution and abundance and distribution of condition classes; and the overall health of the forest, including insect and disease infestation and the potential for wildfires.

All action alternatives propose use of the shelterwood and clearcut silvicultural systems or modifications of those systems. Prescribed treatments are the same for Alternatives 2, 3, and 4. Initial effects to vegetation would be similar for these alternatives. Effects to vegetation would vary slightly for Alternatives 5 and 6 and 2A due to helicopter logging (alternative 5) and leaving islands in the clearcuts (Alternatives 6 and 2A). Please refer to EFFECTS BY ALTERNATIVE in this chapter, for a detailed description of the effects by alternative. The main differences when considering all the alternatives is the relative ability to improve growth, health, and vigor (size and location of cutting units, and the acres harvested).

Road construction associated with timber harvesting has a small direct effect on the vegetation because that portion of land committed to roads cannot grow vegetation for a long period of time. Indirect effects on the timber resource from road building would also occur. Roads built to access these timber harvest areas could be used again to facilitate later entries. Fire protection, stand tending, and the ability to monitor and control insect and disease problems would be enhanced through road access. However, road construction would increase the potential for invasion of noxious weeds.

Table IV-5 summarizes the acres treated (by silvicultural system and community) and the estimated production in million board feet (mmbf) for each alternative. The road and cutting unit locations and sizes are shown on Figures II-2 through Figure II-7 in Chapter II. For a detailed description of the silvicultural systems to be employed, the reader is referred to the Features Common to all Action Alternatives in section of Chapter II.

TABLE IV-5: ACRES HARVESTED, ESTIMATED TIMBER HARVEST AND HARVEST METHOD BY ALTERNATIVE

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6 PREFERRED	Alt 2A
Acres Harvested Lodgepole Pine Community[1]	0	410	270	645	124	545	344
Douglas-fir Community[2]	0	158	170	202	168	202	158
Total Acres Harvested	0	568	440	847	292	747	502
Percent of Analysis Area Harvested Lodgepole Pine Community[1]	0	4.7	3.1	7.4	1.4	6.3	4.0
Douglas-fir Community[2]	0	3.8	4.1	4.9	4.1	4.9	3.8
Total Percent of Analysis Area Harvested	0	3.7	2.9	5.5	1.9	4.9	3.2
Estimated Timber Harvest (MMBF)[3]	0	4.9	3.75	6.9	1.79	6.10	4.2

TABLE IV-5: ACRES HARVESTED, ESTIMATED TIMBER HARVEST AND HARVEST METHOD BY ALTERNATIVE (continued)

	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6 PRE-FERRED	Alt 2A
Acres Harvested Lodgepole Pine Community[1]	0	410	270	645	124	545	344
Harvest Method							
Clearcut with islands	0	0	0	0	0	427*	402
Clearcutting	0	410	270	645	124	186	10
Shelterwood	0	158	170	202	168	202	158

[1] - Lodgepole pine or mixed conifer lodgepole pine, subalpine fir, Engelmann spruce and Douglas-fir on subalpine fir habitat types
[2] - Predominantly Douglas-fir with minor inclusions of lodgepole pine and/or subalpine fir on subalpine fir and Douglas-fir habitat types
[3] - Million board feet
* - Total acreage within harvest unit boundary

Age Diversity

The desired future condition of areas available for the application of timber management as established by the Forest Plan shall contain the following distribution of timber stand age classes in the year 2030 (Forest Plan, IV-90) (Table IV-6). This age distribution is desirable in order to produce a distribution of size and age classes that are more vigorous, more resistant to insect and disease infestation, and more productive than existing stands.

TABLE IV-6: DESIRED DISTRIBUTION OF AGE CLASSES IN YEAR 2030 (In percent of analysis area)

Age Class	Years	Percent
1	0-19 years	31.1
2	40-79 years	16.8
3	80-119 years	1.0
4	120-159 years	15.9
5	160+ years	35.2

This desired distribution is major in relation to current age classes of timber stands in the Moyer Salt Analysis Area. Currently less than 5% of the forested areas in the analysis area are in age class 1. The remaining 95% of the forested areas are in age classes 3, 4, and 5. This skew in age class distribution is major because unless some of the stands that are currently in the older age classes are converted to younger age classes, this distribution will not be met. In addition, it is generally considered unhealthy for large areas of an ecosystem to be occupied by one particular phase of development, as is the case for most of the analysis area. Such an ecosystem would be considered unbalanced and would lose flexibility to respond to environmental changes.

In order to bring these stands into a more productive status and to improve the age distribution toward the desired future condition, silvicultural treatments are needed that would convert some of the older, slow-growing, overmature stands into younger, more vigorous stands.

Action alternatives that would convert the largest acreages of forested stands in the older age classes to younger, immature second growth stands through regeneration harvests (a harvest that removes trees in order to make regeneration possible) and subsequent timber stand improvement activities would have the greatest effect on increasing the productivity and the age distribution of the forest. The index used to measure this effect is the estimated acreage of timber harvested in each alternative, and is displayed in Table IV-7 by alternative.

TABLE IV-7: AGE DISTRIBUTION FOLLOWING HARVEST (In percent of analysis area)

Age	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6 PRE-FERRED	Alt 2A
1 (0-39 years)	4.9	9.3	8.3	11.5	7.2	10.7	8.8
2 (40-79 years)	0	0	0	0	0	0	0
3 (80-119 years)	11.7	11.7	11.7	11.7	11.7	11.7	11.7
4 (120-159 years)	69.9	66.1	67.1	64.0	68.3	64.9	66.6
5 (165+ years)	13.5	12.9	12.8	12.7	12.8	12.7	12.9

Insects and Disease

Insects and disease infestations have caused reduced stand growth and increased mortality within the analysis area. Silvicultural treatments proposed for all action alternatives reduce present insect and disease levels and improve the resistance of trees to these agents in the regenerated stand as well as the entire area in general. The relative ability of the individual alternatives to treat insect and disease conditions varies with the number of acres cut, as described in the following 'Effects by Alternative' section.

Mixed conifer stands still show the effects of a major mountain pine beetle epidemic during the 1930's. The level of dwarf mistletoe infestation is heavy throughout these stands. If left untreated, reduced stand vigor as a result of total stand infection by mistletoe would increase the likelihood of a subsequent insect infestation. Harvest of the mixed conifer stands would produce a variety of age and size classes in the lodgepole pine forest community in order to prevent damage due to insects, disease, and fire. Post harvest timber stand improvements would also be performed in all regenerated stands at a relatively young age in order to maintain tree and stand vigor by removing infected trees. Decreasing the competitive interaction within a stand would also help maintain stand health and vigor, as well as reducing the time needed to meet the desired future condition in terms of tree size and stocking levels.

Douglas-fir bark beetle and western spruce budworm infestations have been heavy due to prolonged drought and subsequent stress, and have caused defoliation throughout the Douglas-fir stands. Silvicultural methods prescribed for the Douglas-fir forest would lessen the effects of Western spruce budworm and Douglas-fir bark beetle by removing infected overstory and understory hosts and replacing them with more vigorous stands containing non-host species under even-aged management. Some regenerated stands would have the overstory removed before the regeneration reaches three feet in height. As in the lodgepole communities, removal of infected trees and decreasing the competitive interaction within

the regenerated stands would maintain tree and stand health and vigor.

Fire Management Considerations

The objective of fire management in the analysis area is the prevention of stand-destroying fires within the lodgepole community and substitution of management activities that replicate the natural role of fire. This is accomplished in part through the proposed timber harvest activities and associated slash disposal. All action alternatives propose timber harvest in the lodgepole forest community and thus will create age-class mosaics which help reduce the potential for stand-destroying fires.

All action alternatives utilize silvicultural systems designed to harvest the regenerated stands before they become susceptible to infestation and mortality due to mountain pine beetle or other insects or diseases. This will provide an opportunity to substitute human management of the forest for fire. In addition, the harvesting of lodgepole pine trees for house logs, firewood, posts and poles, and woodchips will provide additional opportunities for fuel management through harvesting.

Noxious Weeds and Exotic Plants

For all action alternatives, the potential for noxious weeds or exotic species to become established in areas where logging activities have exposed bare mineral soil would increase. Ground disturbance in areas such as road cut and fill slopes, landings, skid trails, and burned slash piles may create conditions favorable for the establishment of these weeds. Knapweed is the primary species of concern in this area, although establishment by other weed species is also possible. The most common way that knapweed is spread is on machinery from infested areas elsewhere in the area, when the seed is carried on the tires and undercarriage of trucks, cars, logging equipment, and so on. Other exotic species such as thistle also tend to enter areas that have been disturbed and may affect the divesity of plant species in these areas.

The Cobalt District has an ongoing weed control program for knapweed and other weeds that utilizes an annual application of chemical herbicide. The control program has proven successful in reducing the rate of spread of knapweed and in some areas reducing the actual level of infestation. The Forest Plan and the Noxious Weed Program Environmental Assessment provide direction for the control of noxious weeds.

The potential for weed invasion and the acreage of weed control required for each action alternative would be directly correlated to the amount of ground disturbance due to timber harvesting and road construction.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

In this alternative, no road building or silvicultural treatments would occur. No timber would be supplied to local mills or contributed towards the Allowable Sale Quantity established in the Forest Plan. No improvement in site productivity could be achieved through conversion of trees that are no longer growing to younger, productive stands through timber harvest and regeneration of the site. This would leave timber stands in the area well below their site potential and at high risk of further losses from disease, decay, and mortality. No change in the existing condition classes or age class distribution would occur under Alternative 1. There would continue to be a disproportionate percentage of acres in the older age classes and condition classes.

In the lodgepole community, mature/overmature pole-sized stands can persist for varying lengths of time if undisturbed. Because this a seral tree species, these stands would eventually die and the stand would move towards climax. In northeastern Washington and Northern Idaho, lodgepole pine stands begin to die at 80 to 100 years; at higher elevations in Montana, they may live several hundred years (Tackle 1961). Trees in this area can therefore be expected to live 100 to 200 years. These stands are overstocked and competition between trees is high. Eventually , overpopulation of trees per acre or competition induced mortality (self-thinning) would begin to occur. Although neither density nor competition directly kill the tree, the effects of severe competition makes the individual trees susceptible to other agents of mortality. For example, the reduced vigor associated with overstocking may result in greater susceptibility to insect attacks (Keen, 1936; Westveld 1954; Waring and Pitman, 1980). As the lodgepole pine trees die, these stands would eventually take

on the appearance of the mixed conifer stand condition of the lodgepole pine community.

Within the mixed conifer stands, deferment of timber harvesting would allow them to succeed toward their climax state, in the absence of major disturbance. These stands are currently well on their way toward the climax forest of subalpine fir. The shade-intolerant seral lodgepole will eventually be replaced by the more shade-tolerant subalpine fir. Although occasional lodgepole pine seedlings will continue to be established under the forest canopy for some time, they will rarely grow to maturity (Lotan and Perry, 1983).

Deferment in all of the lodgepole pine forest communities would favor the subalpine fir component and a multi-story canopy. This would result in higher levels of activity by western spruce budworm and other insects and diseases, and cause a long term reduction in tree growth in these stands (Brookes et al, 1985).

The risk of potential wildfire would be greatest in the no action alternative because of the larger acreage of heavy fuels resulting from mortality of trees that would die if not harvested, and because no new firebreaks would be constructed in the form of roads or harvest units. A transportation system would not be developed that would provide access for personnel and equipment in the event of a wildfire.

Loss of trees to mortality and not converting stands of older, nonproductive trees to a more productive status conflicts with the existing management direction for the area to manage for a long term output of commercial sawtimber.

Alternative 2

This alternative would yield 4.9 mmbf of timber to local timber mills. It would convert 568 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the third greatest number of acres under immediate management, increasing average productivity of the area (less than Alternatives 4 and 6 but more than Alternatives 3, 5 and 2A). This alternative would shift 568 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 9.3 percent. This alternative utilizes the transportation best suited for fire suppression efforts in the lodgepole community in the event of wildfire.

To meet visual quality objectives contained in the Forest Plan, many of the clearcut units in the mixed conifer stands would be restricted to 15 acres or less in size. The regenerated stands of lodgepole seedlings would initially be relatively insect and disease free. However, due to the high perimeter-to-area ratio of these small stands, they would be highly susceptible to dwarf mistletoe spores falling from older infested trees and onto the younger trees, resulting in total infection of the regenerated stands. The small units would also diminish the ability to locate unit boundaries utilizing topographic features and changes in timber type which are normally employed when designing harvest units in dwarf mistletoe-infected lodgepole pine timber types. Reduced stand vigor as a result of total stand infection by mistletoe may increase the likelihood of a subsequent insect infestation. Where unit size is constrained only by insect and disease standards and guidelines, the regenerated stands would be susceptible to dwarf mistletoe infection along the edges where adjacent stands are already infected. Unit layout employing topographic boundaries and changes in timber type would help to slow reinvasion.

Douglas-fir stands would be harvested with either a standard or group shelterwood system. In order to meet all resource objectives contained in the Forest Plan, all units except one would be limited to 25 acres or less in size. As a result of limiting unit size, substantial untreated areas would remain for a major time period. These untreated areas would continue to incur mortality from Douglas-fir beetle. Immature understory trees would continue to receive varying levels of damage and mortality from Western spruce budworm. It is conceivable that future management alternatives for untreated stands would be reduced or precluded due to lack of adequate seed-producing trees and healthy understory trees.

Alternative 3

This alternative would yield 3.75 mmbf of timber to local timber mills. It would convert 440 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the fifth greatest number of acres under immediate management, increasing average productivity of the area (less than Alternatives 2, 4, 6 and 2A but

more than Alternatives 1 and 5). This alternative would shift 440 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 8.3 percent.

Alternative 3 leaves a large portion of the lodgepole pine forest community unroaded and unharvested, thereby increasing the potential for fire. Under this alternative there would also be less vehicular access for fire suppression efforts.

This alternative is similar to Alternative 2 in that to meet visual quality objectives contained in the Forest Plan, many of the clearcut units in the mixed conifer and shelterwood units in the Douglas-fir stands would be restricted to 15 and 25 acres in size, respectively. This alternative is similar to Alternative 2 in its ability to improve growing conditions at the stand level.

This alternative proposes harvest of two Douglas-fir shelterwood units (12 acres) and two clearcuts (30 acres) not included in Alternative 2. The shelterwood stands have no understory and are located on relatively dry sites characterized by steep terrain. Leave trees would be left to provide seed and shade to the regenerated stand. However, slopes in this area are steep enough to prevent machine site preparation; as a result, full stocking of regeneration could take as much as 20 years.

Alternative 4

This alternative would yield the highest amount of timber, 6.9 mmbf, to local timber mills. It would convert 847 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the highest number of acres under immediate management, increasing average productivity of the area more than any of the other action alternatives. This alternative would shift 847 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 11.5 percent.

The transportation system developed for this alternative is best suited for fire suppression efforts in the lodgepole community in the event of wildfire.

In the lodgepole pine community, unit size would be determined only by Forest Plan insect and disease standards and guidelines. Therefore, maximum efficiency of improving growth, health, and vigor of the treated stands would be achieved. Where dwarf mistletoe levels are extremely high unit size may reach 60 acres. The regenerated stands would still be susceptible to dwarf mistletoe infection along the edges where adjacent stands are already infected, but the use of larger units would provide for boundary placement techniques employing topographic features and changes in timber type that are designed to help slow reinvasion.

In Douglas-fir stands harvest units would be designed to maximize harvest of trees that will die in the near future, release understory trees present on the site, and control Douglas-fir bark beetle and Western spruce budworm infestation. In stands that are currently considered openings for big game (they provide forage rather than cover) or where existing natural regeneration would provide desired stocking levels and hiding cover after harvest, unit size may exceed 40 acres. Untreated cover patches between units would adhere to Forest Plan Wildlife Standards and Guidelines (Forest Plan, IV-121). Douglas-fir stands would be logged by tractor. The majority of the stands are under 40 percent in slope and are therefore conducive to machine site preparation.

Alternative 5

This alternative would yield 1.79 mmbf of timber to local timber mills. It would convert 292 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the sixth greatest number of acres under immediate management. This alternative would shift 292 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 7.2 percent.

This alternative proposes harvest of three Douglas-fir shelterwood units (S6, S11, 30) and four clearcuts (1W-4W) also included in Alternative 4.

Where clearcutting is prescribed, this alternative is the same as alternative 4 in its ability to improve growing conditions at the stand level. At the project level, Alternative 5 leaves the entire lodgepole pine forest community (located within the roadless area) unroaded and unharvested. The effects of deferring treatment in such a sizable portion of the lodgepole community would be the same as described in Alternative 1 - No Action.

The risk of potential wildfire would, for this portion of the lodgepole community, be as great as the no action alternative because of the large acreage of heavy fuels resulting from mortality of trees that would die if not harvested, and because no new fire breaks would be constructed in the form of roads or harvest units. A transportation system would not be developed that would provide access for personnel and equipment in the event of a wildfire.

Douglas-fir stands would be harvested with an irregular shelterwood system. As in Alternative 4, Douglas-fir stands harvest units would be designed to maximize harvest of trees that will die in the near future, release understory trees present on the site, and control Douglas-fir bark beetle.

The irregular shelterwood method is not as effective in controlling western spruce budworm as the group shelterwood employed in Alternatives 2, 3, and 4. The delay in performing the removal cut in order to allow increased height growth of the regeneration will maintain the current multistory situation which encourages western spruce budworm.

In stands that are currently considered openings for big game (they provide forage rather than cover) or where existing natural regeneration would provide desired stocking levels and hiding cover after harvest, unit size may exceed 40 acres. Untreated cover patches between units would adhere to Forest Plan Wildlife Standards and Guidelines (Forest Plan, IV-121). Unlike the other alternatives all Douglas-fir stands would be logged by helicopter. Machine scarification and slash piling would be infeasible due to lack of road access, therefore, pinegrass will be expected to increase following harvest eventually forming a dense sod. The establishment of this sod could delay regeneration for 20 years or longer. The effects of delayed regeneration would be to delay the removal cut of the shelterwood for up to 35 years or longer. Although it is difficult to predict, it is highly likely that continued defoliation by western spruce budworm would result in loss of incremental growth and some mortality in the existing advance regeneration.
Douglas-fir beetle attacks to the overstory trees would continue to cause mortality to shelterwood trees left for seed and shade. Depending on the severity of damage by western spruce budworm and Douglas-fir beetle, planting may be necessary to achieve full stocking of the site. At current costs, planting may be infeasible due to the prohibitive access to these units.

The delay in establishing regeneration not only would delay the removal cut of the shelterwood but would also delay the treatment of adjacent Douglas-fir stands. Silvicultural alternatives for treating these stands may be reduced to clearcutting and planting due to the absence of acceptable trees to leave for seed and shelter.

The risk of potential wildfire (of greatest concern in the lodgepole community) would increase as the logging and thinning slash would be left untreated due to lack of piling and scarification.

Alternative 6 PREFERRED

This alternative would yield the second highest amount of timber, 6.10 mmbf, to local timber mills. It would convert 747 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the second highest number of acres under immediate management, increasing average productivity of the area more than the alternatives 1,2,3,5, and 2A but less than alternative 4. This alternative would shift 747 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 10.7 percent.

The transportation system developed for this alternative is best suited for fire suppression efforts in the lodgepole community in the event of wildfire.

In Douglas-fir stands harvest units would be designed to maximize harvest of trees that will die in the near future, release understory trees present on the site, and control Douglas-fir bark beetle.

The irregular shelterwood method is not as effective in controlling western spruce budworm as the group shelterwood employed in Alternatives 2, 3, and 4. The delay in performing the removal cut in order to allow increased height growth of the regeneration will maintain the current multistory situation which encourages western spruce budworm.

In stands that are currently considered openings for big game (they provide forage rather than cover) or where existing natural regeneration would provide desired stocking levels and hiding cover

after harvest, unit size may exceed 40 acres. Untreated cover patches between units would adhere to Forest Plan Wildlife Standards and Guidelines (Forest Plan, IV-121). Douglas-fir stands would be logged by tractor. The majority of the stands are spell 40 percent in slope and are therefore conducive to machine site preparation.

In the lodgepole community, where slopes permit, approximately 15% of the area within the clearcuts would be left in uncut islands approximately 1 acre in size. Preferred areas to be maintained as islands would be those containing Douglas-fir and/or Engelmann spruce, areas with lower fuel loadings and/or areas with high quality advanced regeneration. The islands would still contain varying percentages of dwarf mistletoe infected lodgepole pine (both in the understory and overstory). The greatest spread of dwarf mistletoe is from overstory trees to understory trees, thus units containing uncut islands have a greater potential for more rapid infection than standard clearcuts. It would be important to fell or remove infected lodgepole pine overstory trees located on the edges of the islands soon after logging.

To meet visual quality objectives contained in the Forest Plan, many of the clearcut units in the mixed conifer stands would be restricted to 15 acres or less in size. The regenerated stands of lodgepole seedlings would initially be relatively insect and disease free. However, due to the high perimeter-to-area ratio of these small stands, they would be highly susceptible to dwarf mistletoe spores falling from older infested trees and onto the younger trees, resulting in total infection of the regenerated stands. The small units would also diminish the ability to locate unit boundaries utilizing topographic features and changes in timber type which are normally employed when designing harvest units in dwarf mistletoe-infected lodgepole pine timber types. Reduced stand vigor as a result of total stand infection by mistletoe may increase the likelihood of a subsequent insect infestation. Where unit size is constrained only by insect and disease standards and guidelines, the regenerated stands would be susceptible to dwarf mistletoe infection along the edges where adjacent stands are already infected. Unit layout employing topographic boundaries and changes in timber type would help to slow reinvasion.

Overall the retention of islands should be beneficial. Regenerated stands should more closely approximate the species mix currently occupying the site. Although lodgepole would be the predominant species, greater amounts of Douglas-fir, Engelmann spruce and subalpine would be expected. Retention of the islands would be the best way to ensure protection of snags and retention trees that may otherwise be pushed over or damaged during the skidding and piling process. The islands will maintain microsites that are representative of existing stand conditions.

Alternative 2A

This alternative would yield the fourth highest amount of timber, 4.20 mmbf, to local timber mills. It would convert 502 acres of older, unproductive trees to younger, more vigorous conditions. This alternative would place the fourth highest number of acres under immediate management, increasing average productivity of the area more than the alternatives 1, 3 and 5 but less than alternatives 2, 4, and 6. This alternative would shift 502 acres from age classes 4 and 5 and to age class 1 and would increase the percent of age class 1 from 4.9 to 8.8 percent.

The transportation system developed for this alternative is best suited for fire suppression efforts in the lodgepole community in the event of wildfire.

Douglas-fir stands would be harvested with an irregular shelterwood system.

The irregular shelterwood method is not as effective in controlling western spruce budworm as the group shelterwood employed in Alternatives 2, 3, and 4. The delay in performing the removal cut in order to allow increased height growth of the regeneration will maintain the current multistory situation which encourages western spruce budworm.

In order to meet visual quality objectives contained in the Forest Plan, all units except one would be limited to 25 acres or less in size. As a result of limiting unit size, substantial untreated areas would remain for a major time period. These untreated areas would continue to incur mortality from Douglas-fir beetle. Immature understory trees would continue to receive varying levels of damage and mortality from Western spruce budworm. It is conceivable that future management alternatives for untreated stands would be reduced or precluded due to lack of adequate seed-producing trees and healthy understory trees.

In the lodgepole community approximately 10% to 30% of the area within the clearcuts would be left in uncut islands ranging from 1/2 to 1 acre in size. Unlike Alternative 6 the island concept would be attempted in steep units with heavy fuel loadings. Even with protective measures such as designated skid trails and hand firelines, some portion (up to all) of these islands may be destroyed during logging and slash disposal. Preferred areas to be maintained as islands would be those containing Douglas-fir and/or Engelmann spruce, areas with lower fuel loadings and/or areas with high quality advanced regeneration. The islands would still contain varying percentages of dwarf mistletoe infected lodgepole pine (both in the understory and overstory). The greatest spread of dwarf mistletoe is from overstory trees to understory trees, thus units containing uncut islands have a greater potential for more rapid infection than standard clearcuts. It would be important to fell or remove infected lodgepole pine overstory trees located on the edges of the islands soon after logging.

To meet visual quality objectives contained in the Forest Plan, 17 of the 25 clearcut units in the mixed conifer stands would be restricted to 15 acres or less in size (21 of the 25 clearcut units would have less than 20 acres treated). The regenerated stands of lodgepole seedlings would initially be relatively insect and disease free. However, due to the high perimeter-to-area ratio of these small stands, they would be highly susceptible to dwarf mistletoe spores falling from older infested trees and onto the younger trees, resulting in total infection of the regenerated stands. The small units would also diminish the ability to locate unit boundaries utilizing topographic features and changes in timber type which are normally employed when designing harvest units in dwarf mistletoe-infected lodgepole pine timber types. Reduced stand vigor as a result of total stand infection by mistletoe may increase the likelihood of a subsequent insect infestation. Where unit size is constrained only by insect and disease standards and guidelines, the regenerated stands would be susceptible to dwarf mistletoe infection along the edges where adjacent stands are already infected. Unit layout employing topographic boundaries and changes in timber type would help to slow reinvasion.

CUMULATIVE EFFECTS

Cumulative effects on the timber resource would result from the past, proposed, future or lack of timber management in the analysis area.

At the project level Alternatives 1 and 5 leave the entire lodgepole pine forest community (located within the roadless area) in an unmanaged condition. The low vigor associated with these overmature stands will continue to decline making the individual tress increasingly susceptible to agents of mortality. The risk of fire occurring and the severity of potential fires will continue to increase as these trees die.

Where harvest units are designed to meet visual quality objectives (Alternatives 2,3,5,6 and 2A), removal of adjacent stands (leave strips) will not occur until first entry regenerated stands reach an average height of 22-25 feet. As a result of limiting unit size and delaying the second entry, substantial untreated areas will remain for a major time period. In lodgepole pine stands where dwarf mistletoe levels are high, the combination of small first entry units and delaying the removal of infected leave strips until first entry units are regenerated to a height of 22-25 feet, could result in total infection of the regenerated stand. Findings by Knutson and Tinnin, 1981 indicated that growth measurements of trees heavily infected by dwarf mistletoe are up to 25% lower than comparable uninfected trees.

In Douglas-fir stands where the irregular shelterwood is employed, the desired condition of four age classes and canopy levels would tend to cause continual damage by western spruce budworm. The amount and intensity of this damage can directly affect the growth and regeneration of Douglas-fir. The effects on regeneration begins with the damage to the cones and defoliation and top-killing of the cone-producing portion of the tree (Fellin, Schmidt, and Carlson, 1984).

In the Douglas-fir community, untreated areas would continue to incur mortality from Douglas-fir beetle. Immature understory trees would continue to receive varying levels of damage and mortality from Western spruce budworm. It is conceivable that future management alternatives for untreated stands would be reduced or precluded due to lack of adequate seed-producing trees and healthy understory trees.

Although no timber harvest of the size of the proposed sale is planned within the analysis area, harvest of up to 100 acres of primarily post and pole material through small sales is a reasonably foreseeable future action. The cumulative effect of these activities would be to convert overstocked, unproductive stands to a more productive status and to improve the health of the forest through management activities designed to reduce the effects of insects and diseases.

An undetermined amount of acres within the analysis area may also be assessed for dead material (firewood and house logs). The use of lodgepole pine for house logs, firewood, posts and poles, and woodchips would provide opportunities for fuel management related harvesting. Any entry for post and pole material, firewood, house logs, or timber stand improvements that would require road building or the use of heavy equipment would have a separate environmental analysis.

As managed stands become established, improved productivity and reduced losses to disease, decay, and mortality would help make a sustained amount of timber available to industry. Timber harvested in this entry would, of course, reduce the amount available in the near future until such stands again reach commercial size.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest plan standards and guidelines.

EFFECTS TO WILDLIFE RESOURCES

In accordance with Forest Plan direction and intent, three species from the Salmon National Forest's list of management indicator species (MIS) known or thought to occur in this analysis area were selected for effects assessments: elk, pine marten and goshawk. These species were chosen for discussion because they have the most specific habitat requirements and are the most likely to be affected by proposed activities. They are therefore representative of other MIS species that occur in the area that have similar or less specific habitat requirements. The following text also describes potential effects to other MIS and to non-MIS species that occur in the analysis area and summarizes the discussion of MIS species in the Biological Evaluation (the reader is referred to Appendix G for a more detailed discussion of effects to MIS species). Listed and proposed threatened and endangered species and sensitive species are discussed in a separate section.

Elk are extremely popular animals that provide major recreational benefits and economic importance to the Salmon area. Spring, summer and fall elk habitat is provided within this analysis area, as are excellent calving/nursery areas. Pine marten are associated yearlong with old-growth spruce/subalpine fir habitats, and goshawk are dependent upon old-growth stands of a variety of tree species.

Several species which may be of general interest to the public but are not under specific Federal or State management direction for threatened, endangered, or sensitive species were discussed in Chapter III. They include: black bear, cougar, bobcat, coyotes, beaver, blue, ruffed, and Franklin's grouse, pileated woodpecker, brown creeper, and various songbirds. All proposed alternatives will maintain habitat for populations of each of these species.

Appendix D contains a species list of all mammals (residents and migrants), amphibians, reptiles, birds (residents, summer residents, migrants, and winter visitors), and fish (anadromous and resident) that are known to occur in the analysis area or whose habitat exists in the analysis area. Many of these species whose habitat exists in the area have not been observed there.

For wildlife assessment purposes, the total analysis area has been divided into two areas, based upon wildlife habitat similarities (Chapter III and Figure III-2). Area I is at lower elevations and consists primarily of Douglas-fir stands with minor mixed conifer timber stands in the Douglas-fir/pinegrass and subalpine fir/grouse whortleberry habitat types. Area II occurs at upper elevations and is dominated by fairly uniform stands of lodgepole pine or mixed lodgepole pine and subapline fir with minor amounts of Englemann spruce within the subalpine fir/grouse whortleberry series of habitat types.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Timber harvest and associated road construction have the potential to affect wildlife resources through direct habitat alteration, short-term disturbance during the life of the project, and post-sale or long-term disturbance due to increased access (Lyon and Ward, 1982).

All action alternatives in this proposal will harvest timber (i.e. remove a portion of available big game cover) in both Wildlife Analysis Areas. In Area I, cover removal will slightly decrease elk habitat potential or, simply stated, the ability of the area to "grow" or "produce" elk. In Area II, however, cover removal will slightly increase elk habitat potential. The net effect of these changes on the elk habitat potential of the entire analysis area will not be significant. However, important changes in habitat security and vulnerability of harvested species, especially elk, will result from all action alternatives.

Elk habitat security is generally defined as continuous blocks of unbroken cover at least 250 acres in size, covering at least 30% of the area and located at least one-half mile from an open road. Area I currently has a moderate to high amount of security cover. But, due to the relatively small blocks of cover (natural) that occur in this area and the placement of proposed harvest units, security cover will be reduced to only one area on the north slope of Salt Creek for all the action alternatives except Alternatives 3 and 5. Security cover will be reduced in this area by these two alternatives also, but not as greatly. Area II is currently very high in security cover and will remain acceptably high under all alternatives. Assumptions for both these areas include closing all new roads to all but administrative use.

Big game (i.e. elk) vulnerability is determined by such parameters as the length and timing of hunting seasons, season structure (i.e. with sex, bull only, branch antlered bull only, etc.), type of season (i.e. rifle, archery, etc.), weather and available habitat. When habitat factors such as human access, cover:forage ratio and security cover are altered, vulnerability changes. Consequently, to maintain status quo in a big game herd in the face of habitat changes, it becomes necessary to alter one or more of the other factors that affect vulnerability. All action alternatives will change, to varying degrees, available habitat in both Wildlife Analysis Areas. Predicted effects on vulnerability, ranked by alternative from least to most would be:
Alternatives 1, 5, 3, 2A, 2, 6, 4.

New and/or better human access increases the vulnerability of hunted and trapped species and may even cause shifts in traditional use patterns. This is particularly true when dealing with big game habitat parameters such as calving/fawning areas, key winter or summer ranges and security areas due to the specific criteria that determine suitability and use (Thomas et al., 1979). Many studies have shown the importance of timber/nontimber ecotones, particularly those poorly defined or gradient ecotones between sagebrush and open timber, for elk calving and nursery areas. Pregnant cow elk normally enter this type of habitat, if available, shortly before giving birth. After birth, calves usually spend one to three weeks hiding in sagebrush with a 20 to 40 percent crown cover growing along such ecotones. Nearby timbered portions within about 200 feet of the ecotones receive heavy use during this period by both cows and calves. Cow/calf bands are also commonly observed in the ecotonal habitats during the early summer period.

Analyses of the current and predicted elk habitat potential (EHP) values were based primarily upon cover:forage ratios and road densities (Thomas et al., 1979). Predicted effects on elk calving and nursery habitats were based upon the Central Idaho Elk Guidelines (Ralphs et al., 1979). Predicted decreases in available acres of old-growth spruce-fir and Douglas-fir were used to evaluate effects upon pine marten and goshawk, respectively. Post-sale access was also used for these two species. Project level stand exam data were not available for all stands in this total analysis area. Therefore photo-interpretation was also used to inventory both elk cover and old growth stands.

EFFECTS BY ALTERNATIVE

Table IV-8 summarizes the predicted wildlife effects of each alternative in terms of road densities, cover:forage ratio, EHP, big game habitat security, and available acres of old-growth habitat. These effects are discussed, by alternative, in the following section.

Alternative 1 - No Action

Alternative 1 would have no immediate or short-term effects on big game cover:forage ratios, habitat security, key components or vulnerabilty and would not affect acres of available old-growth habitat. Area I is slightly cover-limiting; thus, the present cover:forage ratio of 32:68 and EHP of 67 percent would not change. The current open road density is 0.14 miles per square mile and would remain unchanged. Big game habitat security values would remain high in the absence of additional road construction and cover removal. Old-growth Douglas-fir would remain present in natural abundance. Pine marten habitat would remain unchanged, though not of high quality due to the paucity of spruce/fir stands. The abundant, natural timbered/nontimbered ecotones between Douglas-fir and sagebrush/grass habitat types would remain intact. Consequently, the excellent goshawk habitat would not be altered.

In Area II, the current open road density of 0.56 miles per square mile and the EHP of 87 percent would remain unchanged, as would the 80:20 cover forage ratio. Big game habitat security would remain very high and vulnerability would remain low in the absence of additional road construction and cover removal. Available acres of old growth and excellent pine marten habitat would remain unchanged. However, the opportunity to increase habitat diversity and EHP would be lost. Goshawk habitat would remain at its naturally low value.

Alternative 2

About 4 miles of road would be built in Area I to harvest timber from approximately 214 acres. This area is cover limiting for elk and is essentially unroaded at present with an open (and total) road density of 0.14 miles/square mile. This action would reduce the cover:forage ratio from 32:68 to 27:73 and the EHP would be reduced from 67 percent to 51 percent. The total road density would increase to 1.46 mile/square mile. A limited amount of road building and timber harvesting would occur in the Salt Creek portion of this area. Consequently, some of the big game security area on the south side of Salt Creek, particularly in the head of the drainage, would remain useable as would the high use forage area on the north side. Overall elk security would be low and vulnerability would be very high.

The timbered/nontimbered ecotones in this area would be buffered by leaving uncut strips at least 100 feet wide between them and all proposed units. No units are proposed within areas designated as old-growth retention stands in the Forest Plan. However, the total old growth available to species dependent on this type of wildlife habitat would be decreased by approximately the full 214 acres of harvest units. None of these units contain significant amounts of Englemann spruce, and pine marten habitat would therefore not be significantly decreased by the harvest.

TABLE IV-8: EFFECTS TO WILDLIFE HABITAT IN THE MOYER SALT ANALYSIS AREA

Measurement Indices	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PREFERRED	ALT 2A
WILDLIFE							
Elk and Deer:							
* Elk Habitat Potential (EHP) (Percent of potential)							
Area I	67%	51%	51%	48%	59%	51%	53%
Area II	87%	90%	88%	92%	88%	90%	89%
Open Road Density: (Miles road per square mile)							
Area I	0.14	0.14	0.14	0.14	0.14	0.14	0.14
Area II	0.56	0.56	0.56	0.56	0.56	0.56	0.56
Total Road Density: (Miles road per square mile)							
Area I	0.14	1.46	2.25	1.0	0.14	1.0	1.28
Area II	0.56	2.5	1.5	2.9	0.72	2.7	2.42
Cover to Forage Ratio:							
Area I	32:68	27:73	27:73	26:74	29.71	27.73	28.72
Area II	80:20	72:28	75:25	68:32	77.23	69.31	73.27
** Elk Habitat Security:							
Area I	High	Low	Moderate	Very Low	Moderate	Low	Low
Area II	Very High	High	High	High	Very High	High	High
*** Elk Vulnerability:							
Area I	Moderate	Very High	High	Very High	High	Very High	Very High
Area II	Very Low	Moderate	Low	Moderate	Low	Moderate	Moderate
**** Old-growth Dependent Species:							
Acres of Timber Stands with Old Growth Characteristics Remaining:							
Area I	1750	1500	1520	1430	1625	1475	1540
Area II	3550	3200	3250	3025	3310	3040	3250
Percent Loss of Timber Stands with Old Growth Characteristics:							
Area I	0%	15%	13%	18%	7%	16%	12%
Area II	0%	10%	8%	15%	5%	14%	8%
Acres of Forest Plan Designated Old-Growth Retention Stands Cut:							
Area I	0	0	0	0	0	0	0
Area II	0	0	0	0	0	0	0

* Elk Habitat Potential (EHP) is the indicator for effects to elk and deer and is derived from the cover to forage ratio and the miles of road per square mile.

** Elk Habitat Security is 30% of an area occupied by cover blocks of 250 acres located 1/2 mile from open roads.

*** Elk Vulnerability reflects ease of human access and susceptibility of hunted elk.

**** The acres and percent loss of timber stands with old growth characteristics and old-growth retention stands are the indicators for effects to goshawk, pine marten and other old-growth dependent species.

Trapper access via snowmachine would be facilitated by construction of the proposed roads, if they were to remain open to motorized traffic.

All of the forested portions of this area offer acceptable or better goshawk nesting habitat. In particular, the Douglas-fir stands with an average diameter at breast height (dbh) of eight inches or greater, canopy cover of 40 percent or more, and an average stand size of at least 25 acres provides very good nesting habitat for this species. One hundred and sixty-six acres of this habitat would be lost under this alternative.

About 13 miles of road would be built in Area II to harvest timber from 358 acres. This area is currently forage limiting and has a road density of 0.56 mile/square mile. The existing cover:forage ratio of 80:20 would be changed to 72:28 and the EHP would increase from 87 percent to 90 percent. Total road density would increase to approximately 2.50 mile/square mile. Consequently, the high value this area has as big game security/hiding cover would be slightly decreased, but would remain high and vulnerability would be moderate. No proposed units are within old-growth retention stands, however virtually the entire 358 acres to be harvested are currently in an old-growth condition. In other words, 358 acres or approximately 10 percent of the existing old growth in this area would be removed by this entry. Two proposed units in this area contain significant amounts of Englemann spruce, but this alternative would not measurably decrease pine marten habitat since only 10 percent of the total area is being harvested. The virtually unbroken stands of timber and small amount of Douglas-fir present on this area naturally limits the current goshawk habitat potential. Creation of artificial ecotones along the cutting units may actually increase the foraging habitat for this species.

Alternative 3

In Area I, all predicted effects are essentially identical to those under Alternative 2. However, this alternative requires 3 miles of additional road construction due to the different access route. Consequently, the total post-sale road density would increase to 2.25 miles/square mile, but the open road density would remain at 0.14 mile/square mile. This alternative would require hauling all the volume out of this area through the entire Woodtick Road (FS Road #107) system. This would eliminate that area from use as a displacement area for big game. In addition, heavy elk use now occurs in and is associated with the old Salt Creek and Woodtick Creek Timber Sale cutting units as a result of improved cover to forage ratios in this area. This use would be disrupted as timber is hauled out of the area along the Woodtick Road. Also, this alternative would construct a road through the heavily used Salt Creek drainage and thus impact a key elk summer/fall range and an area of very good security cover on the north-facing slope of the Salt Creek drainage.
Overall habitat security would be moderate and vulnerability would be high.

In Area II, the post-sale cover:forage ratio would be 75:25 and the EHP would increase slightly to 88 percent. Total road density would be 1.5 mile/square mile but open road density would be 0.56 mile/square mile, the same as for all other action alternatives. This alternative would not impact a large area of key elk summer range, as mapped in the Forest Plan and shown on Figure III-2. Consequently, an unroaded area of excellent security/hiding cover would be retained between Area I and Area II. Habitat security would remain high and vulnerability would be low.

The predicted effects on goshawk habitat would not be significantly different from Alternative 2. However, this alternative would affect 153 fewer acres of old growth and pine marten habitat than the previous alternative.

Alternative 4

In Area I, about 4 miles of road would be built to harvest timber from approximately 322 acres. This action would reduce the cover:forage ratio from 32:68 to 26:74, and the EHP would be reduced from 70 percent to 48 percent. The total road density would increase to 1.0 mile/sq. mile. This alternative would require hauling all the volume out of this area through two routes, FS Road #106 and the entire Woodtick Road (FS Road #107) system. As with Alternative 3, the elk use associated with the old Salt Creek and Woodtick Creek Timber Sale cutting units would be disrupted as timber is hauled out of the area along the Woodtick Road. Overall effects in the Salt Creek and Perm Creek area would be similar to those described in Alternative 2, but the large clearcuts (Units S6, 26, and 30) would further reduce cover in this cover-limiting area, would not be utilized as well for big

game forage, and would have a greater effect on small game, non-game, and old-growth dependent species. Elk habitat security would become very low and vulnerability would be very high. Pine marten population viability would not be affected, but individual home ranges would be adversely affected. One hundred seventy eight acres of suitable Northern goshawk nesting habitat would be lost under this alternative, but this would not affect population viability.

In Area II, approximately 14 miles of road would be built to harvest timber from approximately 525 acres of harvest units. This action would reduce the cover:forage ratio from 80:20 to 68:32 and the EHP would increase from 87 percent to 92 percent. The overall potential effects, including effects to pine marten and goshawk, would be similar to those described for Alternative 2. However, units 1W, 2W, 3W, and 4W would be placed in an area that currently provides very good security cover for big game. Elk (i.e. big game) habitat security and vulnerability would be similar to that listed for alternative 2. (Effects on security habitat are hard to quantify, but this alternative would definitely be less favorable to the wildlife resources, particularly the hunted big game species, than any of the other action alternatives).

Alternative 5

In Area I, helicopters would be used to harvest timber from approximately 168 acres. This action would not require any new road construction but would reduce the cover: forage ratio from 32:68 to 29:71. The EHP in this cover limiting area would be reduced from 67 percent to 59 percent. Big game habitat security in the Salt Creek area would remain relatively unchanged. However, this alternative would also require hauling on both routes (FS #106 and #107) with short term effects similar to that discussed under Alternatives 3 and 4. Big game habitat security would be moderate and vulnerability would be high. Predicted effects on old growth, goshawk and pine marten habitats would be similar but less than what was predicted for Alternative 2; and, no additional access would be provided for pine marten trappers.

In Area II, approximately 1.2 miles of new road would be constructed to harvest timber from approximately 124 acres. The existing cover:forage ratio would change form 80:20 to 77:23 and EHP would increase very slightly to 88 percent. Predicted effects on big game would be very similar to that stated for Alternative 3. However, big game habitat security would remain higher due to less new road construction. Effects on old growth, goshawk and pine marten habitat would be less but very similar to Alternative 3; but, it would affect approximately 170 acres less of such habitat.

Alternative 6 PREFERRED

Predicted effects of this alternative on big game are almost identical to Alternative 4 except that islands of uncut timber will be retained in most units. Consequently, even though the units are identical, the cover:forage ratio will only drop to 27:33 and 69:31 in Areas I and II, respectively. These islands will constitute up to 15 percent of the area within the unit boundaries. As a result, this alternative will provide some big game bedding areas within the created forage units, particularly for mule deer. The islands will help break the long sight distances normally found in new harvest units and promote big game use of the forage by conveying a more forested appearance. Big game habitat security would be low in Area I but high in Area II and vulnerability would be very high and moderate, respectively. This harvest prescription will also result in a much shorter cover regeneration time. In addition, leaving uncut islands will more than satisfy FLRMP snag and snag replacement direction and contribute greatly to habitat diversity, particularly for small birds and mammals.

The predicted effects on old growth, pine marten and goshawk habitats would not be significantly different from Alternative 4.

Alternative 2A

Predicted effects of this alternative on big game are almost identical to Alternative 2 except that islands of uncut timber will be retained in most units. Consequently, even though most units are identical, the cover:forage ratio will be only drop to 28:72 and 73:27 in Areas I and II, respectively. These islands will constitute up to 30 percent of the area within unit boundaries. As a result, this alternative will provide some big game bedding areas and limited cover within the created forage areas, particularly for mule deer. Big game habitat security and vulnerability would be identical to Alternative 2 for both areas. The islands will help break the long sight distances normally found in new harvest units and promote big game use of

the forage by conveying a more forested appearance.

This harvest prescription will also result in a much shorter cover regeneration time. In addition, leaving uncut islands will more than satisfy FLRMP snag and snag replacement direction and contribute greatly to habitat diversity, particularly for small birds and mammals.

The predicted effects on old growth, pine marten and goshawk habitats would not be significantly different from Alternative 2.

CUMULATIVE EFFECTS

The proposed future activities would be conducted in compliance with Forest Plan snag retention and replacement guidelines and would not impact designated old-growth retention stands. Consequently, population viability of cavity nesting species and old-growth dependent species would not be affected. However, the habitat for these species would be decreased and local numbers may be affected until stands regenerate to an old-growth condition.

Future timber harvest in Area II would, if performed in compliance with Forest Plan Wildlife Standards and Guidelines (IV-121), help bring the big game cover:forage ratio closer to the desired 40:60 ratio. Additional road construction would negate some of the anticipated benefits; however, EHP would most likely remain in the 85 to 95 percent range. Forest Plan wildlife goals and objectives, preclude any future timber harvest in Analysis Area I until the Moyer Salt Timber Sale cutting units return to cover.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

The proposed timber harvest and road construction activities in all action alternatives, with mitigation measures, meet Forest Plan standards and guidelines for wildlife in Mangement Areas 3A-5A and 3A-5B (Forest Plan, IV-121). Forest Plan standards and guidelines for old growth and snag management will also be met for all alternatives.

EFFECTS TO THREATENED, ENDANGERED AND SENSITIVE SPECIES

In accordance with Forest Service Manual 2672.42, a Biological Evaluation was prepared to assess the potential impacts of the proposed timber harvest activities on terrestrial vertebrates and plants listed on the U.S. Forest Service Intermountain Region Vertebrate Sensitive Species (VSS) list (Appendix G). Separate Biological Assessments of the potential impacts of the proposed activities on listed and proposed Threatened and Endangered terrestrial and aquatic vertebrate species (same BA as in DEIS covering 4 alternatives) were also prepared (Appendix F). The following sections summarize those biological analyses; the reader is referred to Appendices F and G for a more detailed description of the potential impacts to these species.

EFFECTS TO THREATENED AND ENDANGERED AQUATIC VERTEBRATE SPECIES

As required by Section 7(c) of the Endangered Species Act, the U.S. Fish and Wildlife Service (USFWS) was contacted in order to determine whether any listed or proposed Threatened or Endangered species are known to occur in the analysis area (letter, USFWS, January 29, 1991). The Fish and Wildlife Service determined that no Threatened or Endangered Species are present in the analysis area.

Since that determination, however, the Snake River spring and summer chinook salmon has been listed as a `Threatened' Species (Federal Register, April 22, 1992; Effective date May 22, 1992) and the Snake River Basin sockeye has been listed as an `Endangered' species (Federal Register, November 20, 1992; Effective date December 20, 1992).

EFFECTS TO THREATENED AND ENDANGERED TERRESTRIAL VERTEBRATE SPECIES

No listed terrestrial species were included on the original species list (FWS-1-4-91-SP-204) for this project. The Endangered gray wolf was subsequently added when the terrestrial portion of this list was updated on March 31, 1993. A Biological

Assessment (BA) was prepared to assess predicted affects on this species. The BA concluded that the project "may affect but is not likely to adversely affect the Endangered gray wolf, its habitat or its recovery potential." For a more complete review of this assessment see Appendix F.

EFFECTS TO ENDANGERED FISH SPECIES COMMON TO ALL ALTERNATIVES

A Biological Assessment (BA) of the effects of the proposed road construction and timber harvest alternatives was prepared for the Moyer Salt DEIS (see Moyer Salt DEIS and FEIS, Appendix F).

Recent agreements between the Forest Service and the National Marine Fisheries Service, however, have specified both a modification of BA formatting, and expansion of project analysis to encompass possible cumulative subbasin effects as well as direct and indirect project level effects. The final Moyer Salt Biological Assessment of effects to Snake River spring/summer chinook and sockeye salmon is, therefore, being documented within the Salmon National Forest's Proposed Activity Review for the Panther Creek Watershed.

The effects analysis methodology specified for this Proposed Activity Review places a strong emphasis on risks of temperature and sedimentation effects. As the original, independent BA prepared for the Moyer Salt DEIS document included discussions of these temperature and sedimentation risks, conclusions within the pending Proposed Activity Review are not expected to deviate from those of the independent analysis.

Snake River Sockeye Salmon (*Oncorhynchus nerka*): Sockeye salmon of the Snake River system spawn and rear in the morianal lakes of Stanley Basin and the Sawtooth Valley within the Sawtooth National Recreation Area of the Sawtooth National Forest. The immigration and emigration route to and from these nursery areas encompasses the mainstem Columbia, Snake, and Salmon Rivers, including Salmon River corridor areas under the administration of the Salmon National Forest. Although sockeye salmon utilize the mainstem Salmon during their migrations to and from oceanic feeding areas, they do not utilize any off-river tributary streams administered by the Salmon National Forest for spawning or rearing purposes.

Analysis has determined that the seven alternatives identified within the Moyer Salt FEIS would have "No Effect" upon Snake River sockeye salmon habitat, migration opportunities, or populations. This determination reflects a revision of the original determination of "Not Likely to Adversely Affect" and is based upon additional analysis and consultation with Forest Hydrology, Engineering and Fisheries personnel.

EFFECTS TO THREATENED FISH SPECIES

Snake River spring/summer chinook salmon (*Oncorhynchus tshawytscha*): The Panther Creek drainage system was historically a major producer of spring chinook salmon (Reiser, 1986). These historical runs died out in the 1960s due to the chemical pollution of mid and lower mainstem Panther Creek by mining activities (Reiser, 1986; Idaho Department of Fish and Game, 1965).

However, Panther Creek and its historically utilized tributaries, including Moyer Creek, continue to be regarded as potentially viable producers of spring/summer chinook salmon (Northwest Power Planning Council, 1988). The Forest Plan calls for continued management directed toward these anadromous stocks in anticipation of correction of mine drainage problems and recovery of mainstem water quality. Idaho Department of Fish and Game management prescriptions for the two streams calls for a preservation management strategy for anadromous fish stocks, which maintains a harvest closure and may supplement natural recruitment with fry stockings (Idaho Department of Fish and Game, 1991).

Alternative 1 - No Action

This alternative would have "No Effect" upon Snake River spring/summer chinook salmon habitat or populations. No road construction or timber harvest activities would occur, and no associated change in chinook salmon habitat capability from current conditions would be expected. Changes to streamcourses would be expected to occur in response to natural events such as fire, insect infestation and subsequent loss of forested cover, and other natural processes.

Under the no action alternative, the existing Woodtick Creek culvert (Township 20 N, Range 19 E, Section 32) would not be reconstructed or replaced, and would continue to present a barrier to upstream steelhead and resident trout passage. Failure to correct this barrier would have no effect on upper Panther Creek chinook salmon populations, as this species is not known to utilize the Woodtick Creek drainage.

Re-utilization of chinook salmon spawning and rearing habitats in Moyer Creek, where historical use has been known to occur, would be contingent upon recovery of mainstem Panther Creek water quality and the reintroduction of the fish.

Alternatives 2, 4, 5, 6, and 2A

With implementation of Forest Plan soil and water Best Management Practices (BMPs) (Appendix B) and proposed site-specific soil, water and fisheries mitigation measures (Chapter II, Table II-1), the road construction and timber harvest activities proposed under each of Alternatives 2, 4, 5, 6, and 2A are "Not Likely to Adversely Affect" Snake River spring/summer chinook salmon populations or habitat within the Moyer Creek drainage. Additionally, no adverse effects to chinook salmon populations in mainstem Panther Creek waters would be anticipated as a result of implementation of these proposed alternatives.

Alternative 3

Alternative 3 exhibits a high risk of adversely impacting the water quality and substrates of the Salt Creek stream channel due to sediment introduction at the proposed Salt Creek stream crossing. Steep sideslopes at this site preclude flat, perpendicular road approaches, and the proximity of road to the Salt Creek stream channel inhibits application of mitigation measures designed to intercept overland transport of fill slope materials. The sedimentation risk associated with this Salt Creek crossing, coupled with the prediction of BOISED modeling that this alternative will inherently generate the most amount of sediment of seven alternatives analyzed, indicates that this alternative, as currently designed, is likely to produce adverse impacts to the substrates and water quality of this stream. As the scope of these impacts may include potential chinook salmon rearing areas within the lower reaches of Salt Creek, and could potentially extend to important chinook salmon spawning and rearing habitats within the mainstem reaches of Moyer Creek, this alternative has been determined to be "Likely to Adversely Affect" Snake River spring/summer chinook salmon.

EFFECTS TO SENSITIVE SPECIES

The Biological Evaluation for terrestrial vertebrates and plants and the Biological Evaluation for aquatic vertebrates that were prepared for the analysis area address the potential impacts of the proposed timber harvest activities on species listed on the U.S. Forest Service Intermountain Region Vertebrate Sensitive Species (VSS) list (Appendix G).

Some of these species are also listed on the Idaho Department of Fish and Game Species of Special Concern (SSC) list. The Forest Service Intermountain Region VSS list contains 29 vertebrate species and the Forest Service Intermountain Sensitive Plant List contains 12 species that may occur on the Salmon National Forest. As discussed in Chapter III, one terrestrial and two aquatic vertebrate sensitive species have been observed and are thus known to occur in this analysis area. However, habitat for several other species also occurs in the area, and potential effects to those habitats are evaluated. The reader is referred to Appendix G for a more detailed description of the habitat requirements of these species.

EFFECTS TO SENSITIVE AQUATIC VERTEBRATE SPECIES

Several sensitive fish species or their habitat occur within the analysis area. The U.S. Forest Service Intermountain Region VSS List includes steelhead trout, westslope cutthroat trout, and bull trout. Those species whose habitat occurs in the analysis area are listed below with a short description of the potential effects of the proposed project.

Steelhead trout (*Oncorhynchus mykiss*): Although steelhead are currently not utilizing the upper Panther Creek system because of die-off caused by mainstem water quality problems as a result of chemical pollution from mining, the Salmon National Forest Plan calls for continued management directed toward anadromous habitat maintenance within Panther Creek and its major tributaries.

Alternative 1 - No Action

Under this alternative no road construction or timber harvest activities would occur. This alternative would, therefore, have "No Effect" upon existing steelhead habitat or population status. However, an existing 60 inch culvert in Township 20 N, Range 19 E, Section 32 which is currently a barrier to both resident and anadromous fish passage in Woodtick Creek would not be repaired or replaced through timber program funding, and would continue to limit utilization of approximately three and one-half miles of spawning and rearing habitat above that location. As steelhead are not currently utilizing the upper Panther Creek watershed due to mainstem water quality problems, the immediate significance of impaired passage is restricted to resident trout species, including bull trout. However, upon recovery of Panther Creek water quality and re-utilization of currently unused upper-drainage tributary spawning and rearing habitats, this barrier may become of significance to steelhead production within the Woodtick Creek drainage. Other funding mechanisms might be employed to repair or replace this passage barrier.

Alternatives 2, 4, 5, 6, and 2A

Alternatives 2, 4, 5, 6, and 2A are expected to be fully successful in avoiding or minimizing short and long term effects to fisheries habitats and preserving fish migration opportunities within the Moyer Creek and Woodtick Creek drainages through application of Best Management Practices (BMPs) and site-specific mitigation measures. These alternatives are, therefore, "Not Likely to Result in a Trend Toward Federal Listing" of steelhead. Restoration of fish passage capabilities at the site of an existing culvert in Township 20 N, Range 19 E, Section 32 would additionally reopen approximately three and one half additional miles of potential steelhead spawning and rearing habitat in the Woodtick Creek drainage.

Alternative 3

Alternative 3 exhibits a high risk of adversely impacting the water quality and substrates of the Salt Creek stream channel due to sediment introduction at the proposed Salt Creek stream crossing. Steep sideslopes at this site preclude flat, perpendicular road approaches, and the proximity of road to the Salt Creek stream channel inhibits application of mitigation measures designed to intercept overland transport of fill slope materials. The sedimentation risk associated with this Salt Creek crossing, coupled with the prediction of BOISED modeling that this alternative will inherently generate the most amount of sediment of seven alternatives analyzed, indicates that this alternative, as currently designed, is likely to produce adverse impacts to the substrates and water quality of this stream. As the scope of these impacts may include Potential steelhead rearing areas within the lower reaches of Salt Creek, and could potentially extend to spawning and rearing habitats within the mainstem reaches of Moyer Creek, this alternative has been determined to be "Likely to Result in a Trend Toward Federal Listing" of Steelhead.

Bull trout (*Salvelinus confluentus*): Bull trout currently utilize the mid and upper reaches of the Moyer Creek and Woodtick Creek watersheds.

Alternative 1 - No Action

Under this alternative no road construction or timber harvest activities would occur. This alternative would, therefore, have "No Effect" upon existing bull trout habitat or population status.

An existing 60 inch culvert in Township 20 N, Range 19 E, Section 32 which is currently a barrier to both resident and anadromous fish passage in Woodtick Creek would not be repaired or replaced through timber program funding, and would continue to preclude bull trout access to approximately three and one-half miles of spawning and rearing habitat during high flow periods. Other funding mechanisms might be employed to repair or replace this passage barrier.

Alternatives 2, 4, 5, 6, and 2A

Alternatives 2, 4, 5, 6, and 2A are expected to be fully successful in avoiding or minimizing short and long term effects to fisheries habitats and preserving fish migration opportunities within the Moyer Creek and Woodtick Creek drainages through application of Best Management Practices (BMPs) and site-specific mitigation measures. These alternative are, therefore, "Not Likely to Result in a Trend Toward Federal Listing" of bull trout. Restoration of fish passage capabilities at the site of an existing culvert in Township 20 N, Range 19 E, Section 32 would additionally reopen approximately three and one half additional miles of potential bull trout spawning and rearing habitat in the Woodtick Creek drainage.

Alternative 3

Alternative 3 exhibits a high risk of adversely impacting the water quality and substrates of the Salt Creek stream channel due to sediment introduction at the proposed Salt Creek stream crossing. Steep sideslopes at this site preclude flat, perpendicular road approaches, and the proximity of road to the Salt Creek stream channel inhibits application of mitigation measures designed to intercept overland transport of fill slope materials. The sedimentation risk associated with this Salt Creek crossing, coupled with the prediction of BOISED modeling that this alternative will inherently generate the most amount of sediment of seven alternatives analyzed, indicates that this alternative, as currently designed, is likely to produce adverse impacts to the substrates and water quality of this stream. As the scope of these impacts may include potential bull trout rearing areas within the lower reaches of Salt Creek, and could potentially extend to spawning and rearing habitats within the mainstem reaches of Moyer Creek, this alternative is" Likely to Result in a Trend Toward Federal Listing" of bull trout.

Westslope cutthroat trout (*Oncorhynchus clarki*): Although aquatic habitat capable of supporting cutthroat trout exists within both Moyer Creek and Woodtick Creek, no documentation of the presence of this species has been recorded in these two streams. The small populations of cutthroat trout existing in Panther Creek are found almost exclusively in that portion of the stream above the mouth of Moyer Creek. The seven proposed alternatives, therefore, are expected to have "No Effect" on cutthroat trout within the Panther Creek drainage.

EFFECTS TO SENSITIVE TERRESTRIAL VERTEBRATE SPECIES COMMON TO ALL ACTION ALTERNATIVES

Sensitve terrestrial vertebrate species that are known to exist or whose habitat exists in the project area are listed below with a short description of the potential effects of the proposed action alternatives on the species and/or its habitat.

Northern Goshawk (*Accipiter gentilis*): Northern goshawks require dense mature to old growth conifer, mixed conifer/aspen or aspen stands for nesting in the Rocky Mountain region (Shuster 1980). Nests are commonly located at least 30 feet above the ground in forested areas with a closed canopy and little or no understory, and are often adjacent to open water. Nests are often used for several seasons (Call, 1978).

Suitable nesting habitat in the form of mature to overmature conifer or mixed conifer/aspen stands is apparently the most significant limiting factor for this species. Any removal of mature conifer stands, particularly Douglas-fir, with an average diameter of 8 inches or greater, canopy closure of 40 percent or greater and at least 25 acres in size reduces the available nesting habitat for Northern goshawks.

For Analysis Area I, approximately 1,750 acres of this preferred habitat is currently present. The various action alternatives in this proposal would remove from 13 to 18 percent of this habitat. This could possibly affect one or more stands used as nest sites. However, preferred habitat would still be available throughout the area and actual abundance, distribution and/or species viability would not be affected.

Analysis Area II contains approximately 3,550 acres of old growth conifer habitat. However, this area is primarily covered by lodgepole pine and subalpine fir, and thus is much less preferred goshawk nesting habitat. From 8 to 15 percent of this habitat would be removed by the various action alternatives in this area. These alternatives should therefore not adversely affect goshawk distribution or abundance. Openings created in this densely forested area should increase diversity and abundance of prey species.

These two areas have not sustained previous timber harvest activities. Consequently, goshawk nesting habitat is currently available in pristine or natural quantity. The one nest site known to be present, in Analysis Area I, will not be disturbed by any of the currently proposed action alternatives. If additional nest sites are located before or during the proposed sale activities, mitigation measures outlined in the Forest Plan direction would be followed. These mitigations restrict timber harvesting and other human disturbance in a buffer zone with

a 1/2 mile radius around an occupied nest (Forest Plan, IV-20).

American lynx (*Felis lynx canadensis*): Lynx depend very heavily upon snowshoe hare as their principal food source. In this analysis area, snowshoe hare and thus lynx are most commonly found in the spruce/subalpine fir forests where shrubby riparian zones and/or openings occur. These areas provide both good conifer cover and browse for hares. Consequently, any irregular pattern of logging and/or fire in high elevation forests usually provides prime hare and lynx habitat. Therefore, timber harvest activity as proposed in any of the Moyer Salt Timber Sale action alternatives should actually have a positive effect on lynx (and snowshoe hare) populations, particularly in Area II.

Wolverine (*Gulo gulo*): The large home range size, low population density and non-selective feeding nature of this species makes it fairly unsusceptible to site-specific disturbances such as timber harvest activities. This is especially true since primary wolverine habitat occurs at elevations above most commercial forest sites on this Forest and in this analysis area. Also, since new roads would be closed after the proposed sales, human presence would not be significantly different from the current situation. For these reason, this proposed action is not expected to affect possible wolverine presence and/or habitat.

Western or Townsend's big-eared bat (*Plecotus townsendii*): Caves, abandoned mine tunnels and deserted buildings are known to be used by nursery colonies and for hibernaculum sites by the Western big-eared bat. None of these factors are known to exist within this analysis area. Therefore none of the proposed action alternatives are expected to have any direct or indirect effects on this species.

Boreal owl (*Aegolius funereus*): In this analysis area, none of Area I (the lower elevation portion) and less than 1.4 percent of Area II (the higher elevation portion) that would be harvested is within cover types that may provide suitable nesting habitat for boreal owls. Since boreal owls actually utilize edges for feeding and since this proposal only affects a small percentage of the total area, any effects precipitated by an action alternative would have a minimal effect on boreal owl habitat suitability.

Northern three-toed woodpecker (*Picoides tridactylus*): Alternatives under this proposal are primarily confined to elevations below the preferred habitats of this species. The magnitude of affected suitable habitat would be similar to those for boreal owl. Consequently, no effects on this species would be predicted.

Great gray owl (*Strix nebulosa*): Great gray owls use open forests and openings for preferred feeding sites and prefer platform nest sites. These factors make this species relatively unsusceptible to effects due to the proposed action alternatives, and, in fact, the harvest openings would contribute to the preferred feeding sites until obscured by regeneration.

Spotted frog (*Rana pretiosa*): The proposed action is not expected to have any effect upon spotted frogs because the only crossing on Woodtick Creek, the sole stream in the analysis area that may harbor them, would be an open bottom culvert. In addition, there are no proposed harvest units closer than approximately 0.3 of a mile to this stream and most are further than 0.5 mile from it.

Alternative 1 - No Action

Under the no action alternative, no adverse effects to sensitive wildlife species or to their habitat would occur as a result of proposed activities. However, the possible benefits to American lynx and great gray owl habitat would not occur, and the risk of a large wildfire that may affect these species' habitat would not be lowered.

EFFECTS TO SENSITIVE PLANT SPECIES COMMON TO ALL ACTION ALTERNATIVES

Of the 12 species on the current Forest Service Intermountain Region Sensitive Plant Species list for the Salmon National Forest, only Lemhi beardtongue may occur within the analysis area.

Lemhi beardtongue (*Penstemon lemhiensis*): Recent field surveys indicate that this species is quite abundant on specific sites in this Forest. It has been located in the Panther Creek drainage, but not within the analysis area. Lemhi beardtongue is an early successional species that readily colonizes disturbed sites such as burned areas and road cut and fill slopes. For this reason, the activities proposed in all of the action alternatives are not expected to adversely affect this species and, if it is present but not detected, it would likely benefit from the proposed activities.

Given the habitat types that the Lemhi beardtongue is found in (meadow and sage complexes), it is not likely that any of the harvest units are located where they would conflict with this plant species. It is possible that road locations occurring in meadows or sagebrush openings would affect this species. Site-specific surveys would be completed before activities take place, and if Lemhi beardtongue is discovered, roads would be relocated around the plants.

Alternative 1 - No Action

Under the no action alternative, no adverse effects to sensitive plants would occur as a result of timber harvesting. However, the possible spread of Lemhi beardtongue to disturbed sites created by road construction and timber harvesting would not take place.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest Plan standards and guidelines for management of threatened, endangered and sensitive species.

EFFECTS TO ROADLESS RESOURCES

The construction of roads and the harvest of trees have an irreversible and irretrievable effect when the activity occurs on an area that was formerly roadless. These activities, by their ground and vegetative disturbance, have a direct effect on the physical, biological and social attributes of an area. Indirectly, the character is changed because sights and sounds of human activities are apparent from adjacent ground, undisturbed islands become isolated from the larger undeveloped area by linear pockets of development, and access into an area is facilitated. The effect these activities have on a roadless area make it unlikely that Congress would further consider that portion of the roadless area underlying the analysis area for inclusion into the National Wilderness Preservation System (NWPS).

Analysis of the effects of the various alternatives on the roadless resource as done by plotting the proposed harvest and road building activity on a map of the Taylor Mountain Roadless Area (Figure III-4). Acres of disturbance and total roadless acres affected by the disturbance were determined. Effects on the special areas and wilderness attributes of the Taylor Mountain Roadless Area, as described in Chapter III, were addressed qualitatively.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

All action alternatives, except Alternative 5, propose some combination of timber harvest and road construction within the boundaries of the identified roadless area. Alternative 5 proposes 4 harvest units within the roadless area but no road construction. Irreversible and/or irretrievable effects would occur if any of the action alternatives are implemented. Alternatives vary in their magnitude and in the location of effect. However, since the same general areas are being entered in all action alternatives except alternative 5, the roadless acres affected is the same for alternatives 2, 3, 4, 6 and 2A. The amount for these alternatives is approximately 9,920 acres or about 16 percent of the total acreage of the Taylor Mountain Roadless Area. Alternative 5 would affect approximately 208 acres or less than one-half of one percent of the total acreage of the Taylor Mountain Roadless Area.

The effects of all action alternatives are summarized in Table IV-9. Because the differences between the effects due to each individual alternative are so small, discussion of each alternative is not warranted.

None of the action alternatives have effects on any of the special places identified in Chapter III, nor do they affect the ability to identify logical and manageable boundaries for the remainder of the roadless area.

All of the action alternatives would adversely affect natural integrity within the specific disturbance areas (roads and harvest units). Natural integrity in the remainder of the roadless area would not be affected.

All of the action alternatives would diminish the apparent naturalness within the disturbance areas. Visitors would have no question that they are encountering an area that has been brought under management versus a natural condition. Apparent naturalness of the remainder of the roadless area would remain high.

None of the action alternatives would affect a visitor's ability to engage in primitive recreation activities, either in the disturbance areas or the remainder of the roadless area.

All of the action alternatives would adversely affect the feelings of solitude and self-reliance within the disturbance areas. Opportunities for solitude would not be affected in the remainder of the roadless area.

None of the action alternatives would affect opportunities for challenging experiences, either within the disturbance areas, or in the remainder of the roadless area.

All of the action alternatives would cause a temporary noise impact within the 9,920 acre affected area from the sounds of logging activity and road construction. This impact would last approximately three years and would vary in intensity and duration. The remainder of the roadless area would not be affected.

Some public comments received during the comment period expressed opposition to any entry within roadless area boundaries. The No Action alternative examines the option of retaining the opportunity for future wilderness designation for the entire Taylor Mountain Roadless Area with no roadless entry. Action alternatives in this proposal explore different levels of opportunity to implement the Forest Plan. All of the action alternatives would leave the roadless area with sufficient acreage (generally 5,000 acres) to be considered for inclusion in the NWPS. Within this remaining 84 percent (53,300 acres) of the roadless area, the sights, sounds and natural integrity would be maintained, and the feelings of serenity and "wildness" could be experienced to the same degree as the present.

Alternative 1 - No Action

Alternative 1 would maintain the current condition of the roadless resource in the designated roadless area. There would be no direct, indirect, or cumulative effect on the roadless resource. The opportunity for Congress to consider the entire area for Wilderness inclusion in the NWPS would be retained.

TABLE IV-9: EFFECTS ON THE ROADLESS RESOURCE BY ALTERNATIVE

Alternative	1	2	3	4	5	6 PRE-FERRED	2A
Total road miles	0	16.8	14.6	17.8	0	17.8	16.8
Total road acres	0	101.8	88.5	107.9	0	107.9	101.8
Proposed harvest acres	0	568.0	440.0	763.0	208.0	731.0	560.0
Total roadless acres affected	0	9,920	9,920	9,920	208	9,920	9,920
Percent of roadless area affected	0	16	16	16	<1	16	16
Acs of roadless area remaining	63,220	53,300	53,300	53,300	63,012	53,300	53,300

CUMULATIVE EFFECTS

Reasonably foreseeable actions common to all action alternatives include thinning within the proposed harvest units and salvage of post and pole material, firewood and house logs. The effects of these operations on the roadless resource would be the same as the effects of the action alternatives. No permanent roads would be built to access post and pole sales, and the effects of the harvest would be incidental compared to the timber harvest associated with the alternative itself.

In addition to the Moyer Salt and Salt Creek Timber Sale, two other timber sales are also being considered within the boundary of the Taylor Mountain Roadless Area within the reasonably foreseeable future. The Park Creek Timber Sale would be on the Salmon Ranger District of the Salmon National Forest and the Opal Creek Timber Sale would be on the Cobalt Ranger District of the Salmon National Forest.

The Park Creek Timber Sale on the Salmon Ranger District of the Salmon National Forest is planned to take place in 1998 and would affect the southeast tip of the roadless area. Road construction that is part of the proposed action would penetrate approximately two miles into the boundary of the Taylor Mountain Roadless Area. Total direct disturbance is tentatively planned as 3 miles of road construction and 172 acres of harvest contained in 9 cutting units. This would result in approximately 1,920 additional roadless acres affected (Personal communication, Salmon Ranger District Timber Forester, July, August, 1991).

The Opal Creek Timber Sale on the Cobalt Ranger District of the Salmon National Forest is planned to take place in the mid to late 1990's and would affect the southwest edge of the roadless area. This proposed sale also proposes road construction that would penetrate one to two miles into the Taylor Mountain Roadless Area. Total direct disturbance is tentatively planned as 1 to 2 miles of road construction and 165 acres of harvest. This would result in approximately 640 additional roadless acres affected (Personal communication, Cobalt Ranger District Timber Forester, July, August, 1991).

These sales would only affect the edges of the roadless area, and most likely would not be considered major intrusions. Neither one would preclude the remainder of the area from being considered for inclusion in the NWPS.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest Plan standards and guidelines for management of the Taylor Mountain Roadless Area.

VISUAL EFFECTS

Timber harvest and road building can affect the visual resource by altering the existing form, color, line and texture in a given view area or "viewshed." If the extent of the activities are great enough, Visual Quality Objectives (VQO's) may be affected. Visual effects of the change depend on the interaction of five factors: 1) Access to timber stands by roads and skid trails, 2) harvest methods and silvicultural systems, 3) slash disposal methods, 4) design, shape and grouping of harvest units, and 5) topographic relation to the viewer's position.

The analysis for visual quality was conducted by applying the standard Visual Management System inventory procedures. The inventory identifies Visual Quality Objectives to be applied to the project area. Basically, the VQO's determine which portions of the landscape would be visible to viewers using sensitive travel routes, and how to protect the seen areas from undesirable development effects depending on their location to the viewer.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

There would be change apparent in the visual resource from various points along the sensitive travel routes identified in Chapter III. Generally, the visual variety of the landscape would change, making management activities more evident as areas would be harvested and roads would be built.

When harvest units appear in the foreground the visual resource would change considerably. A typical harvest unit would have areas of bare ground with much of the remaining area covered by slash. After disposal, the slash would be blackened from fire, or piled. Recovery would take place as the ground cover re-establishes and seedlings become established and grow, with the scene changing as the new stand of trees gains added height over a number of decades.

When harvest units appear in the middle ground or background, the visual resource would change on a much larger scale, with the overall pattern, shape and size of openings and the introduction of horizontal road scars the predominant feature.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

Alternative 1 would permit the continued evolution of the vegetative component of the landscape. Fire suppression efforts would continue, changing the condition of the forest from that which would occur naturally. The visual environment would slowly change as the stages of vegetation establishment proceed through their cycles. The viewshed throughout the project area would continue to meet Forest Plan VQO's.

Alternative 2

This alternative would have the second greatest effect on the visual resource after Alternative 4. Harvest units and constructed roads would be visible from major travel routes in the area. However, techniques such as irregular edges on the harvest units would be employed to lessen the effects on the scenery. Overall, this alternative would meet the assigned VQO's of Partial Retention and Modification.

Alternative 3

This alternative would have the second least adverse effect of the action alternatives on the visual resource, primarily due to the fact that it contains lesser amounts of ground disturbing activity. Harvest units would still be visible, but would remain visually subordinate to the characteristic landscape, and the VQO's of Partial Retention and Modification would be met.

Alternative 4

This alternative would have the greatest adverse effect on the visual resource as it would cause more change than the other action alternatives. Clearcut harvest units, large shelterwood units and roads would be visible from the major viewpoints and the existing visual experience would not be maintained. Openings in the forest canopy would be evident, as would road corridors, primarily in the background. These openings would exceed the Forest Plan standards and guidelines by as much as two to four fold (30 to 60 acre range versus recommended 15 acre clearcuts in background Partial Retention).

The management activities would result in an achieved VQO of Modification, instead of the assigned VQO of Partial Retention, for harvest units 4W, 22, S6, S12 and S13. The activities would be highly evident and dominate the scene, rather than remain visually subordinate to the characteristic landscape, and not be highly evident to the casual visitor.

Alternative 5

This alternative would not have a significant effect on the visual resource due to the small number of acres being treated overall and the minimal amount of road construction proposed. Overall, this alternative would meet the assigned VQO's of partial retention and modification.

Alternative 6 PREFERRED

This alternative has incorporated two additional design features over Alternative 4 that will substantially reduce visual impacts. The first is a reduction in the size of the visible units that were indicated as a problem in Alternative 4. Second, will be the application of leave islands in 16 of the 26 proposed clearcuts. Overall, this alternative would meet the assigned VQO's of partial retention and modification.

Alternative 2A

This alternative should have the least overall effect on the visual resource of all the action alternatives. The leave island concept would be used in 24 of the 26 proposed clearcuts, as well as a much greater effort to protect and save residual understory, both of which will contribute substantially to maintaining a forested appearance. This alternative would meet the assigned VQO's of partial retention and modification.

CUMULATIVE EFFECTS

There are no planned or foreseeable surface disturbing activities within the analysis area for the remainder of the current planning period, which extends through 1998. The only timber harvest activities planned within the analysis area are timber stand improvements (such as thinning) within the proposed cutting units, and firewood and post and pole salvage. No additional roads are planned for construction for the thinning or salvage activities.

There would be no additional adverse effects to the visual resource from these activities. In fact, scheduled thinning would encourage more rapid growth of remaining trees and new trees that grow on the site, thereby hastening the recovery of visual effects.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

Alternative 4 would not meet the VQO's assigned in the Forest Plan for this portion of the Forest. This alternative would result in an achieved VQO of Modification, rather than Partial Retention, for five of the harvest units. Alternatives 1, 2, 3, 5, 6, and 2A would meet all assigned VQO's, if proposed visual resource mitigation measures are implemented.

RECREATION EFFECTS

Timber harvesting and its associated activities could affect the recreation resource in the following manner:

1. Road building and tree removal affect the physical and visual quality experienced on a recreational trail. The strongest effect is generally created in the foreground. For example, a clearcut located alongside or overlapping a trail would have the greatest immediate effect on the quality of the time spent on that trail by a horserider, backpacker, trailbiker, etc. The close-up presence of roads, stumps, slash piles, manmade openings, etc., is acknowledged to have a greater effect than a middle ground or background harvest unit or road.

   The timber harvest units were examined in relation to Trail #6204, Moyer Peak jeep trail. The linear distance of direct interface or overlap of a proposed road or cutting unit with this trail was then calculated. A cutting unit located in the middle ground or background viewshed from the trail was considered to have no effect.

2. Access opportunities can be changed (either created or removed) by logging activities. New road construction affords the hiker, horse rider, trailbiker, hunter or camper-trailer owner a different way to get to a trail, access a stream or camping spot, or get closer to better big game habitat. These opportunities are difficult to quantify. They were measured in this analysis in qualitative terms, i.e., relative increase or decrease.

3. Direct conflict between a recreational activity and logging can occur. In the Moyer Creek area, this would take the form of fall logging operations preventing the use of the area by big game hunters. The operation of heavy equipment and hauling on roads could disturb game movement and location patterns rendering the area unsuitable for a quality hunt. In the long-term, however, access to the area would be improved and more hunting would occur.

4. The construction of roads and harvesting of trees can result in the conversion of acres within the Recreation Opportunity Spectrum. In this case, the development activities would result in conversion from Semi-Primitive Motorized and Semi-Primitive Nonmotorized to Roaded-Natural Appearing.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

None of the action alternatives would have a direct impact on users of the Moyer Peak jeep trail (trail #6204) since proposed harvest units are located in the middle ground and background view from this trail. However, all action alternatives, except Alternative 5, would result in a one half mile reduction of historic vehicle access when a spur road off of the Moyer Peak jeep trail is closed.

If fall logging operations were to occur, it would likely affect the quality of big game hunting opportunities in the immediate area of the activity. The period of displacement of hunters would likely not exceed three years.

All action alternatives will increase the use of human access into the area, increase the vulnerability of hunted species and decrease habitat security for both hunted and non-hunted species. This

would contribute to the continuous erosion of the habitat base for hunted species and the need for more restrictive hunting season regulations such as a shorter season and thus the loss of consumptive recreational opportunities.

EFFE BY ALTERNATIVE

Alternative 1 - No Action

Alternative 1 would have no adverse effect on current recreation activities and use patterns. Overall, the quality of the recreation setting would remain high.

Alternative 2

Alternative 2 would have the second most adverse effects on recreation after Alternative 4 in terms of effects on the physical and visual quality of the area due to timber harvesting and road construction.

It would convert approximately 6,990 acres from Semi-Primitive Motorized and Nonmotorized to Roaded-Natural Appearing. Overall, the quality of the recreation setting would remain high.

Alternative 3

Alternative 3 would have the second least adverse effects on recreation of the action alternatives in terms of impacts to the physical and visual quality of the area by proposed project activities.

It would convert approximately 6,310 acres from Semi-Primitive Motorized and Nonmotorized to Roaded-Natural Appearing. Overall, the quality of the recreation setting would remain high.

Alternative 4

Alternative 4 would have the most adverse effects on recreation. The quality of the setting would diminish from an aesthetic standpoint in the vicinity of the management activities.

Alternative 4 would convert approximately 6,990 acres from Semi-Primitive Motorized and Nonmotorized to Roaded-Natural Appearing. Overall, the quality of the recreation setting would remain high.

Alternative 5

Alternative 5 would have the least adverse effects on recreation of the action alternatives in terms of impacts to the physical and visual quality of the area by proposed project activities.

Since no new roads would be constructed into the current semi-primitive areas, there would be no conversion of acres from the semi-primitive motorized and nonmotorized to roaded-natural appearing. Overall, the quality of the recreation setting would remain high.

Alternative 6 PREFERRED

Same as alternative 4 with improvement from an aesthetic standpoint.

Alternative 2A

Same as alternative 2 with improvement from an aesthetic standpoint.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All of the action alternatives would generally meet the desired future condition of maintaining the current high quality of dispersed recreation settings, although Alternative 4 would result in some lessening of the desired visual quality of the area.

EFFECTS TO AIR QUALITY

Prescribed burning, dust, vehicle emissions, and wildfire could temporarily degrade air quality in the analysis area and surrounding airshed. The small local communities of Elk Bend and Salmon, Idaho, about 13 and 25 miles southeast and northeast of the analysis area, respectively, could be inconvenienced by smoky conditions for short periods. In case of a major wildfire, smoky conditions could persist in the Lemhi Valley and parts of the Salmon River drainage airshed for several weeks, depending on local climate conditions, especially wind direction.

Prescribed Burning

Slash treatment by burning would be prescribed for all action alternatives for the Moyer Salt Timber sale. Slash would be either piled and burned (in either windrows or piles) or broadcast burned, depending on the harvest system used and the slope of the site. These fires would produce isolated and short-term degradation of air quality; the intensity of the effect would depend on weather conditions during and immediately following burning. However, in the long term, state and federal air quality standards would be met for all alternatives.

Before the timber sale would be harvested, fuels specialists would prepare prescribed burn plans that would specifically address the conditions on each cutting unit. Burning would be conducted under favorable atmospheric and fuel-moisture conditions. At least 10 to 15 tons of large woody material would be retained for soil productivity, wildlife, and site protection, and would also reduce smoke emissions (compared to intense wildfire). Most burning would occur at elevations above and away from populated areas and under conditions that provide for excellent, good or fair smoke dispersal. The burn prescriptions would comply with State of Idaho Air Quality Regualtions.

Dust and Vehicle Emissions

Dust and vehicle emissions would temporarily reduce air quality in the immediate sale vicinity. All action alternatives would require the application of water to roads as needed to reduce dust. The amount of vehicle emissions would depend on the amount of timber harvested and the number of logging trucks required to haul logs. Impacts related to dust and vehicle emissions would be short-term and temporary in nature.

EFFECTS BY ALTERNATIVE

Alternative 1 - No Action

Under the no action alternative, no timber harvesting would occur and therefore no slash burning would occur. Effects to air quality due to wildfires may be indirectly increased because the high potential for wildfire and the poor access to the area would not be improved through timber harvesting and road construction.

With no timber harvesting there would be no increased impacts due to dust and vehicle emissions. Ongoing dust and vehicle emissions due to Forest Service vehicles and recreation users would still occur on the existing road network.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

The estimated increase in particulate concentration (PM-10) was calculated for each alternative using the Simple Approach Smoke Estimation Model (SASEM) developed by the Bureau of Land Management (Sestak and Riebau, 1988). This model calculates total suspended particulate concentration (PM-10), total particulates emitted (tons), and reduction in visual range due to smoke from controlled burns. The model calculates emissions from data on the size of the burn, burn type (broadcast or pile), burn duration, fire line intensity, average fuel loading, and the type of fuel that is burned. Average fuel loading was determined using the methods of Anderson (1982). For the purposes of this model it was assumed that 14 tons of debris would remain on the site after burning, within the range of 10 to 15 tons per acre specified in the soils mitigations (listed in Chapter II). The airborne particulate concentrations are calculated from the emission rate, plume rise, wind speed and stability. The model determines the maximum concentration of total suspended particulates less than 10 microns in size (PM) in micrograms per cubic meter (ug/m^3) as well as the reduction in visual range at selected receptors.

The SASEM model calculated the estimated output of PM-10 in ug/m^3 for each of the action alternatives for both broadcast burning and pile and burn methods for excellent, good, fair and poor dispersion days (excellent, good, fair and poor dispersion days are determined by the U.S. Weather Bureau) with wind speeds between 2 and 10 miles per hour. Table IV-10 shows the acres of slash burned and the estimated tons of total particulates emitted calculated by the SASEM model for each of the alternatives; the PM-10 results for each alternative have been removed from the Appendix in the Final but are available for review in the project file.

TABLE IV-10: ACRES OF SLASH BURNED AND ESTIMATED TOATL PARTICULATES EMITTED (tons) BY ALTERNATIVE

Slash Burn Method	Alt 1	Alt 2	Alt 3	Alt 4	Alt 5	Alt 6 PRE-FERRED	Alt 2A
Broadcast Burn (acres)	0	110	120	100	0	100	100
Pile and Burn (# piles)	0	12	24	44	10	36	20
Estimated Total Particulates (tons)*		11.9	11.4	13.3	1.1	12.3	10.6
Broadcast Burn	0	9.3	10.1	8.4	0	8.4	8.4
Pile and Burn	0	2.6	1.3	4.8	1.1	3.9	2.2

* for excellent, good or fair dispersion days with wind speeds between 2 and 10 mph

Under excellent, good and fair dispersion days the estimated PM-10 values for broadcast burning are below the PM-10 standard of 150 ug/m³ established by the Clean Air Act National Ambient Air Quality Standards (NAAQS). Using the pile and burn slash disposal method, Alternative 4, which has the greatest number of piles (44), exceeds the National standards for PM-10 on excellent dispersion days with winds between 2-6 mph; good dispersion days with winds between 5-10 mph; fair dispersion days with winds between 7-10 mph, and poor dispersion days with winds between 2-5 mph. To mitigate these impacts the piles will not all be burned at once, but will be staggered over several days and will only be burned when air dispersion quality ratings will ensure that the PM-10 standards are not exceeded (see Mitigations section of Chapter II). In addition, conditions can be mitigated to meet the 150 ug/m³ standard by burning under favorable fuel moisture and weather conditions. All prescribed burns would be monitored for smoke dispersion during burning to determine if they follow the burn plan, meet SASEM model criteria, and do not violate the Clean Air Act.

CUMULATIVE EFFECTS

The smoke, dust and vehicle emissions that result from implementation of the action alternatives would combine with air pollutants from other projects in the local area such as other timber sale activities, prescribed burns, any mining activities, and recreational use of the area. Some short-term cumulative effects in the Lemhi Valley and parts of the Salmon River drainage may occur.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest Plan standards and guidelines, and would meet National and State air quality standards.

EFFECTS TO RANGE RESOURCES

Timber harvest and associated road building and other activities can affect the range resources of an area in several ways. The openings created by logging and road building encourages growth of grasses, providing additional forage for livestock for 15 to 20 years after initial harvest. However, utilization of this forage by livestock depends on several factors. Cattle will not make much use of

forage that is very far from water or is growing on very steep slopes. Also, large amounts of slash and cull logs near roads may block access to forage growing in logged units. Silviculturalists may deem it necessary to temporarily fence off logged units to protect conifer seedlings from possible damage by livestock. The increase in forage in the harvested areas would also reduce livestock concentration in riparian areas.

New roads allow cattle to travel into areas not previously utilized. This provides additional forage opportunities for cattle and would change the livestock distribution pattern within each allotment. Seeding of the road cuts provides a source of forage which did not exist before, and would facilitate cattle movement into areas not previously used. This could result in cattle crossing unit and allotment boundaries where natural boundaries now exist. Cattle guards, gates, fences and water developments would be used to mitigate these effects for the action alternatives (see Chapter II, Table II-1); these would be identified during development of the Knudsen Vandenberg Plan.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

None of the seven alternatives would have a substantive effect on the range resource. The greatest potential for effects would be the selection of Alternative 4 and 6, which involves the most road construction and timber harvesting, although all action alternatives would affect the range resource to various degrees.

None of the alternatives would have a negative effect on current grazing capacity in any of these allotments.

Alternative 1 - No Action

Under the no action alternative, no timber harvesting and road construction activities would occur. Increased forage that results from timber harvesting would not occur, and grazing impacts to riparian areas would remain high. The grazing patterns and livestock distribution would remain unchanged.

CUMULATIVE EFFECTS

Within the foreseeable future, through this planning period (1998), there would not be planned management activities that would affect the range resource in this analysis area.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All alternatives are consistent with Forest Plan standards and guidelines for range management.

EFFECTS TO TRANSPORTATION AND ACCESS

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

All action alternatives proposed in this EIS would involve construction of new roads. Alternatives 3, 4, 5, and 6 would, in addition, involve reconstruction of an existing road. These roads, when open, would increase access to large tracts of land that are currently inaccessible by motorized vehicles and that are only accessed with difficulty by other means. Improved access to the area would affect wildlife habitat security. However, these roads would be gated and locked except during timber harvesting, periods of wood salvage, and during stand improvement activities. They would not be routinely used for motorized recreation purposes.

As part of the wildlife mitigations that would be implemented for all action alternatives except Alternative 5 (Chapter II, Table II-1) and to prevent access to the proposed new road system via the Moyer Peak Jeep Trail, construction slash will be placed on the road prism for the last 1/2 mile of Road # 60286.1 and on all of roads 60286.2, 60286-C and 60288. This construction slash will be placed on the road prism at an average spacing of 150 feet and will be sufficiently high and wide to impede foot or horse traffic. This will maintain access to an area that has traditionally been accessible by vehicles (Moyer Peak Jeep Trail) but will restrict access to the new closed road system.

An additional effect to the analysis area that would result from the proposed road building would be the increase in the amount of commercial timber-

land available for harvest, assuming an optimum skidding distance of 2,500 feet for tractor skidding and 1,000 feet for cable skidding. There are at present approximately 10,240 acres of suitable timberland (areas that are designated as suitable for timber harvesting in the Forest Plan; see Chapter III for a discussion of suitable timberland) within the 15,360-acre analysis area. Of this area, approximately 1600 acres of timberland are presently accessible for timber harvesting with the existing road system. Table IV-11 gives the acres of suitable timberland that would be available for harvest for each action alternative. The remaining unharvested forest would be more easily accessed for timber stand improvement activities. Increased access would also facilitate fire suppression efforts.

Alternative 1 - No Action

Under the no action alternative, no new roads would be constructed, and access to the area for timber harvest, hunting, fire fighting, or any other purpose would remain unchanged. The roadless attributes of the area would remain unchanged, and the Moyer Jeep trail would not be closed.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives are consistent with Forest Plan standards and guidelines for the Forest transportation system, and are consistent with the management area prescriptions for the area.

TABLE IV-11: ACRES OF COMMERCIAL TIMBERLAND AVAILABLE FOR HARVEST BY EXISTING AND PROPOSED ROAD SYSTEMS, BY ALTERNATIVE

	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PRE-FERRED	Alt 2A
Commercial Timber land Available, Existing Road System (acres)	1,600	1,600	1,600	1,600	1,600	1,600	1,600
Miles of Proposed Road	0	16.8	14.6	17.8	1.1	17.8	16.8
Commercial Timberland Available, Proposed Road System (acres)	0	2,807	1,874	2,957	150	2,957	2,807
Commercial Timberland Available per Mile of Road Constructed (acres)	0	167	128	166	136	166	167

EFFECTS TO MINERALS

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

There are numerous mining claims within the analysis area boundary, but no known mineral deposits have been located and no mineral production has occurred. New road construction in the area could increase interest in prospecting and exploration, both through improved access and in possible new rock exposures created by road cuts. New roads would also allow access by truck-mounted drill equipment, and some drilling could be anticipated.

Mining claimants in the project area would be notified of the proposed road construction and timber harvest. Claimants would be given the opportunity to protect claim corners and discovery monuments. The Forest Service would take measures to ensure that activities do not materially interfere with potential mineral development.

CUMULATIVE EFFECTS

Mineral exploration activities are a reasonably forseeable future action that could involve construction of drilling roads and other surface disturbance activities. Any impacts greater than 20 acres would be assessed under a separate environmental assessment.

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All action alternatives and the no action alternative are consistent with Forest Plan management goals for minerals.

EFFECTS TO CULTURAL RESOURCES

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

Most of the analysis area (areas affected by Alternatives 2 and 3) has been inventoried for cultural resources. No cultural sites were identified and the potential for discovery of cultural sites is considered low (Chapter III, Cultural Resources). Prior to ground disturbance, further field investigations would be done to identify any unknown cultural sites. If any are discovered, a decision would be made to avoid, protect, or mitigate the site in accordance with the National Historic Preservation Act. The timber sale contract contains a clause that allows cancellation or modification of the timber sale contract if cultural resources are found (see Chapter II, Table II-1 for further discussion of Cultural Resource mitigations).

CONSISTENCY WITH FOREST PLAN STANDARDS AND GUIDELINES

All alternatives are consistent with Forest Plan standards and guidelines.

ECONOMIC EFFICIENCY

The economic efficiency of each alternative was evaluated by calculating the present net value (PNV) for each; the results are shown in Table IV-12. PNV was calculated using the same computer-based spreadsheet used for generating the Salmon National Forest's Timber Sale Program Information Reporting System (TSPIRS) Reports. In this method, costs associated with the proposed timber sale such as sale planning, preparation, administration, and on-the-ground costs such as road construction, slash disposal, and reforestation costs are subtracted from the revenues gained from the timber sale. These costs and benefits are inclusive for an entire stand rotation (80-120 years) and then discounted back to the present. This analysis does not consider other non-monetary costs and benefits such as recreation and water production.

Because timber prices are not stable but fluctuate with economic conditions, the PNVs for the Moyer Salt Timber Sale Alternatives 2, 3, 4, and 6 were calculated using two different stumpage values (Table IV-12). Because of the substantial costs associated with helicopter logging, the PNV for Alternative 5 was only determined using the lower stumpage estimate. The "Present Trend" PNV incorporates stumpage values from the 1990 Copperswan Timber Sale on the Salmon National Forest, run with current selling values. The Copperswan sale was chosen for determining

stumpage values because it is located adjacent to the Moyer Salt analysis area, it contained a similar mix of tree species, and has a ratio of road miles per mmbf that is similar to that calculated for the proposed Moyer Salt timber sale. The "Long Term Average" PNV uses the stumpage values in the 1990 TSPIRS Reports that are based on average selling values of all timber sold in the 1990 fiscal year.

The significant differences in stumpage values resulted in dramatically different PNVs. This is a very important point. Alternatives that have the same mix of silvicultural prescriptions will show an increasingly negative PNV with an increase in acres treated when stumpage rates are somewhere below $100/mbf (long term average). On the other hand, a very slight increase in stumpage rates, for example close to or a little over $100/mbf will show the opposite. That is, with an increase in acres, the PNV will be increasingly more positive. Therefore given the likelihood of reduced Federal timber supply and increased stumpage values, it is highly possible that the "Present Trend" PNV will be even higher than estimated and that alternatives that harvest the most acres will ultimately have the highest PNV.

Gross stumpage was calculated and displayed mainly for the purpose of showing the opportunity cost of leaving overmature and stagnant timber stands in a nonproductive condition under the No Action alternative (Table IV-12). Calculations and assumptions for losses due to insect and disease as well as delaying treatment are shown below. Stumpage values used to calculate the "Long-term average" are from the Copperswan Timber Sale, sold in 1990. The "Present Trend" stumpage values were determined using the Copperswan Timber Sale Appraisal with current selling values, resulting in considerably higher values. It is important to note that these "high" values were appraised rates and did not include any additional revenue that may have occurred as a result of competitive bidding.

Road costs were calculated and are displayed to illustrate their effect on "opportunity costs" (return to the government) and sale viability. For example, one would expect lower returns to the government as road costs per mbf increase. These lower returns directly translate into either lower returns to the Treasury or less KV funds to perform sale area improvement projects with.

In addition to lower returns to the government, escalating road costs may eventually reach a point where the sale may not sell. In 1992, road costs on the Salmon National Forest ranged from $17/mbf to $67/mbf. Average road costs for predominantly lodgepole sales (similar to Moyer Salt) were approximately $40/mbf.

As depicted in Table IV-12, alternative 3 for the Moyer Salt timber sale has a road cost in excess of $100/mbf. While road costs are not the only factor that will affect sale viability, costs of this magnitude are a concern. In the event the sale did sell, one could logically expect little return (overbid) to the government.

EFFECTS COMMON TO ALL ACTION ALTERNATIVES

As shown in Table IV-12, the PNV for the six action alternatives is negative for those values generated using the long-term average for calculation of the PNV. Under this scenario, the proposed timber sale would be below cost. Due to the recent rapid rise in timber prices, the PNV for the action alternatives calculated using current selling values are all positive. Given the likelihood of reduced Federal timber supply and increased stumpage values, the "Present Trend" PNV may be even higher than estimated if one of the Moyer Salt timber sale alternatives is sold. All of the action alternative are roughly the same in terms of the PNV per mmbf calculated with the long term average. However, with the PNV calculated with the current selling values, the PNV per mmbf is vastly different, and these differences are discussed below under 'Comparison of Alternatives'.

TABLE IV-12: ECONOMIC EFFICIENCY BY ALTERNATIVE

MEASUREMENT INDICES	ALT 1	ALT 2	ALT 3	ALT 4	ALT 5	ALT 6 PRE-FERRED	ALT 2A
PRESENT NET VALUE:							
Long Term Avg*	0	-$210,077	-$161,329	-$300,679		-$277,853	-$183,069
Present Trend ***	0	+$253,925	+$303,502	+$295,651	-$94,938	+$303,626	+$262,241
GROSS STUMPAGE VALUE: (realized or lost)							
Long term Avg **	0	+$400,670	+$306,186	+$564,444	+$69,315	+$498,801	+$343,235
Present Trend ***	0	+$569,100	+$525,300	+$754,200		+$706,200	+$527,100
ROAD COSTS:							
Construction Costs	0	+$372,150	+$383,850	+$411,150	+$42,000	+$411,150	+$372,150
Road Costs/mbf[1]	0	+$76	+$102	+$60	+$26	+$67	+$89

* Estimated using SNF TSPIRS Values (see text for explanation)
** Estimate based on past timber sale (Copperswan)
*** Estimate based on past timber sale run with current selling values (Copperswan)
[1] mbf = thousand board feet

EFFECTS BY ALTERNATIVE

Alternative 2

Under this alternative, the PNV calculated using 1990 selling prices would be $253,925. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $76 per mbf. This value exceeds road costs for any sale sold in 1992. It may represent an upper limit of sale viability (if a sale will sell). In the event the sale did sell, returns to the government in the form of competitive bidding may not occur.

Alternative 3

Under this alternative, the PNV calculated using 1990 selling prices would be $303,502. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $102 per mbf. These road costs are higher than those calculated for any of the other alternatives, and reflect the cost of a two-road access system designed to address potential effects to wildlife. Road costs of this magnitude may likely contribute to a sale that would not sell. In the event the sale did sell, returns to the government in the form of competitive bidding may not occur.

Alternative 4

Under this alternative, the PNV calculated using 1990 selling prices would be $295,651. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $60 per mbf. These road costs are second lowest of those calculated for other alternatives, and reflect the decrease in cost per mbf for a sale with higher volumes and larger cutting units.

Alternative 5

Under this alternative, the PNV calculated using 1990 selling prices would be -$94,938. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $26 per mbf. These road costs are lower than those calculated for any of the other alternatives, and reflect the use of a helicopter and limited road building. Regardless of road costs, this sale may not be viable due to the high costs of helicopter

yarding. The helicopter costs for this sale are higher than average due to long flights and small piece size.

Alternative 6 PREFERRED

Under this alternative, the PNV calculated using 1990 selling prices would be $303,626. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $67 per mbf. As in Alternative 4, this reflects the decrease in cost per mbf for a sale with higher volumes and larger cutting units.

Alternative 2A

Under this alternative, the PNV calculate using 1990 selling prices would be $262,241. The road costs associated with this alternative, when divided by the net volume produced, yield a road cost of $89 per mbf. Road costs of this magnitude may likely contribute to a sale that would not sell. In the event the sale did sell, returns to the government in the form of competitive bidding may not occur.

POTENTIAL CONFLICTS WITH PLANS AND POLICIES OF OTHER JURISDICTIONS

The following statements are provided to help define the areas of potential differences between the agency proposing this action (U.S. Forest Service) and the policies, management, and enforcement responsibilities of other agencies.

Cultural Resources

The laws and policies that govern cultural resource protection on Federal Lands are coordinated with the State Historic Preservation Officer (SHPO) of Idaho, who serves in an advisory capacity. The policies for USFS and SHPO are consistent.

To date, most of the areas proposed for management activities (action alternatives) have been evaluated for cultural resources. All ground disturbing activities proposed in this EIS would have a cultural resource clearance before any disturbance to the ground would be permitted to occur. Thus, an action alternative implementation would be pending cultural resource clearance in accordance with the National Historic Preservation Act.

PROBABLE ENVIRONMENTAL EFFECTS THAT CANNOT BE AVOIDED

Implementation of any alternatives would inevitably result in some unavoidable environmental effects, both adverse and beneficial. Although the management requirements and mitigation measures associated with the alternatives would reduce or prevent some potential adverse environmental impacts, some impacts could not be completely avoided. Even Alternative 1, the No Action Alternative, has effects. Unavoidable impacts are listed briefly below; the reader is referred to the appropriate resources section in this Chapter for more detailed information.

Visual Quality:

All of the action alternatives, particularly Alternative 4, would have an effect on the visual resource from various viewpoints along the sensitive travel routes identified in Chapter III. Generally, the visual variety of the landscape would change, making management activities more evident as areas are harvested and roads are built.

Air Quality:

The air quality of the analysis area would be temporarily affected during slash burning operations that are scheduled as part of the timber management program. These impacts cannot be mitigated completely but would be performed during periods when air dispersion patterns are favorable and would therefore be temporary in nature.

Roadless Resource:

All action alternatives would affect about 16 percent of the existing roadless condition of the Taylor Mountain Roadless Area, except Alternative 5 which affects less than 1 percent. None of the alternatives would prevent the the remainder of the roadless area from being considered by Congress for incorporation into the NWPS.

Recreation:

Fall logging operations could discourage the use of the area by big game hunters. The operation of heavy equipment and hauling on roads may disturb game movement and location patterns, rendering the area less suitable for a quality hunt.

The proposed action alternatives, if implemented, would result in the conversion of acres within the Recreation Opportunity Spectrum. In this case, the development activities would result in conversion from Semi-Primitive Motorized and Semi-Primitive Nonmotorized to Roaded-Natural Appearing, except for Alternative 5.

IRREVERSIBLE AND IRRETRIEVABLE COMMITMENTS OF RESOURCES

An irreversible commitment of resources refers to the loss of production or use of a resource due to a land use decision that, once executed, cannot be reversed, except perhaps in the extreme long term. An irretrievable commitment of resources applies to losses of production or use of renewable resources for a period of time.

Irreversible and Irretrievable

Roadless:

All action alternatives except Alternative 5 would commit a portion of the roadless resource to timber harvest, with the long-term goal of continuing and expanding timber harvest in that area. Roadless attributes would only be recovered in the extreme long term, even if the roads are obliterated and the area is reforested. Therefore, the commitment is irreversible and irretrievable.

The commitment under Alternative 5 is irretrievable as a result of the harvest of trees but is not irreversible because no roads are constructed within the roadless boundary.

Irretrievable

Vegetation:

Any alternative which chooses to leave overmature and deteriorating timber stands would, to some extent, result in an irretrievable loss of timber productivity (see Economics section, this chapter). The No Action Alternative would have the greatest irretrievable commitment of the timber resources, although other alternatives would also have varying impacts due to variations in the amount of timber harvest. Additional losses of merchantable products through decay and mortality of current stands would also be an irretrievable commitment of no action or reduced action.

Visual Quality:

Alternative 4 would result in an irretrievable commitment of the visual resource, as timber harvest activities would be highly evident and would dominate the scene for decades.

Recreation Resources:

Road construction and timber harvesting in the analysis area would convert acres from Semi-primitive Motorized and Semi-primitive Nonmotorized to Roaded - Natural Appearing. Because the roads and timber harvest units would remain for decades, this impact would be irretrievable.

OTHER REQUIRED DISCLOSURES

Relationship between Short-term Uses of Man's Environment and the Maintenance and Enhancement of Long-term Productivity

Long-term productivity is the capability of the Forest to provide resources into the future. All of the action alternatives improve the condition of the vegetative resource for timber production by converting trees that are old, no longer growing, and infested with insects and diseases into vigorous young and healthy stands. Therefore, the proposed timber harvest and wood utilization would be a short-term use that would improve the long-term productivity of the timber stands.

Energy Requirements and Conservation Potential of Various Alternatives and Mitigation Measures

There would be no unusual energy requirements for implementing any of the alternatives.

American Indian Treaty Rights

None of the alternatives would conflict with any treaty provisions.

Threatened and Endangered Species

In compliance with the Endangered Species Act, the Forest Service consulted with the U. S. Fish and Wildlife Service and the National Marine Fisheries Service concerning Federally Threatened and Endangered Species. The resulting assessment indicates that the habitat of one Endangered species, the gray wolf, and one Federally listed Threatened species, spring/summer chinook salmon, exists in the Moyer Salt analysis area.

The Biological Assessment (BA) for terrestrial vertebrates concluded that the proposed action, with mitigations, may affect but is not likely to adversely affect the Endangered gray wolf, its habitat or its recovery potential.

The effects of the proposed activities on the Snake River spring/summer chinook salmon and Snake River sockeye salmon was documented in a BA prepared for the Moyer Salt DEIS (see Moyer Salt DEIS and FEIS, Appendix F). Recent agreements between the Forest Service and the National Marine Fisheries Service, however, have specified both a modification of BA formatting, and expansion of project analysis to encompass possible cumulative subbasin effects as well as direct and indirect project level effects.

The final Moyer Salt Biological Assessment of effects to Snake River spring/summer chinook and sockeye salmon is, therefore, being documented within the Salmon National Forest's Proposed Activity Review for the Panther Creek Watershed. The effects analysis methodology specified for this Proposed Activity Review places a strong emphasis on risks of temperature and sedimentation effects. As the original, independent BA prepared for the Moyer Salt DEIS document included discussions of these temperature and sedimentation risks, conclusions within the pending Proposed Activity Review are not expected to deviate from those of the independent analysis included within this EIS (See Fisheries section in this Chapter).

Minerals

The proposed project would have no effect on the availability of lands for mining under federal mining laws and regulations.

Water Quality

The State of Idaho Forest Practices Water Quality Management Plan and Forest Plan Standard and Guidelines would be implemented to meet state and federal water quality regulations.

Effects on Prime Farmland, Rangeland, and Forestland

All alternatives are in keeping with the intent of the Secretary of Agriculture Memorandum 1872 for prime land. The analysis area does not contain any prime farmland or rangeland. "Prime" forestland does not apply to lands within the National Forest System. In all alternatives, National Forest System lands would be managed with sensitivity to the effects on adjacent lands.

Effects of Alternatives on Minorities and Women

No effects on Native Americans, other minorities, women, or the civil rights of any United States citizen would be anticipated under any alternative.

Effects on Wetlands and Floodplains

The effects of the proposed actions on wetlands are described in the 'Wetlands' section of this document.

The proposed alternatives would not affect any floodplains.

Chapter V

List of Preparers

Core Interdisciplinary Team Members V-1
Consultation and Review V-3
Approval V-3

CHAPTER V

LIST OF PREPARERS

This section lists USDA Forest Service employees who contributed to this Final EIS by making comments during the interdisciplinary team scoping process, preparing specialist reports, writing sections of the document, and/or providing technical assistance.

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B.S. Range
Certified Silviculturist: course work in ecosystem management, insect and disease control, logging systems, genetics, biological diversity
Author: "Developing Stand Density Guides for Predicting Growth of Timber Species on the Salmon National Forest"
25 years related experience.

Lynn Bennett: team leader/coordinator
B.S. in Natural Resource Management: course work in forest ecology, wildlife biology, watershed management, soils, forest management, economics, silviculture, and logging systems
Graduate credits in: landscape ecology, silviculture, economics, plant physiology, logging systems, population dynamics and plant genetics.
15 years related experience.

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Certified Silviculturist: course work in forest ecology, forest management, and soils.
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Tom Bonn: engineering; transportation
Civil Engineering Technician with course work in logging systems, forest road and transportations, engineering economics, operations analysis, and soil and watershed management.
27 years experience

Tom Buchta: minerals
B.S. Forestry with emphasis in soil science
3 years soil scientist experience

12 years minerals management and planning experience

Robin Fuellenbach: writing/editing/video
B.S. English: technical and expository writing, journalism, photography
M.A. Mathematics: including study in writing technical and environmental documents (NEPA)
18 years related experience.

Clinton Groll: District Ranger
B.S. Range Management: prepared numerous timber related NEPA documents and range allotment management plans and experience in sale preparation and administration. Additional course work in ecology.
26 years related experience

Merry Haydon: cultural resources
B.A. Anthropology; course work in anthropology, archaeology, and geology
Author: over 50 reports and publications pertaining to cultural resources
10 years experience in archaeology and cultural resource management

Pat Johnson: engineering; transportation
B.S. Civil Engineering
25 years related experience.

Gary Jackson, soils/air quality
B.S. Soil Science with course work in soil chemistry, soil physics, soil microbology, soil classification, soil mapping, entomology, organic chemistry, range management, and irrigation water management.
Additional training in air pollution control and smoke management.
Co-author: Willcox Area Soil Survey, Arizona; Coconino County Soil Survey, Arizona; Mt. Trumbull Soil Survey, Arizona; and Los Prades National Forest Soil Survey, California.
25 years related experience.

Steve Matz, heritage resources
M.A. Interdisciplinary Studies with course work in anthropology, archaeological method and theory, geology, soils, cultural resource management, National Historic Preservation Act, and Archaeological Resources Preservation Act.
Author: over 100 reports and publication on Cultural Resource Management issues.
13 years related experience

Robbert Mickelsen: range
B.S. Animal Science/Range Management with course work in integrated resource management, range vegetation, range analysis, soil science, animal nutrition, botany, zoology, forage crops and plant taxonomy.
3 years related experience

Betsy Rieffenberger: water (hydrology)
B.S. Water Resources Development with emphasis on water pollution control. Course work in hydrology, soils and natural resource management.

10 years experience as Forest Hydrologist.

Robert Rose: fisheries
B.S. in Fisheries Management with emphasis on anadromous fisheries resources. Other course work in fisheries biology, water quality, limnology, oceanography.
11 years related experience in anadromous fisheries research, management and culture.

Bruce Smith: fisheries
B.S. Fish and Wildlife Management with emphasis on zoology, botany, English and science.
Additional course work in land, fisheries and wildlife management; riparian habitats; range; minerals; recreation; stream and lake habitat inventory and management.
Graduate studies in fish culture, pond and reservoir management. Two years foreign service in fisheries management and research.
20 years related experience.

Ken Stauffer: recreation/roadless character/visual quality
B.S. Landscape Architecture
14 years related experience.

Patricia A. Ulik: public involvement/writing/editing/video
B.S. Botany/Zoology; M.S. Botany/Zoology
15 years related experience

Dick Wenger: wildlife
B.S. Biology with emphasis on plant and animal ecology and taxonomy
M.S. Wildlife Biology with emphasis on wild ungulate ecology and management and predator-prey relationships
Post Graduate studies in big game population ecology and predator-prey relationships
19 years related experience.

CONSULTATION AND REVIEW

Dan Baird: Branch Chief, Recreation, Range and Wildlife, Salmon National Forest

Gene Jensen: Land Management Planner, Salmon National Forest

Ernie Schneider: Branch Chief, Timber, Aviation and Fire, Salmon National Forest

APPROVAL

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Chapter VI

Scoping and Public Involvement

Scoping and Public and Interagency Participation Opportunities VI-1
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CHAPTER VI

SCOPING AND PUBLIC INVOLVEMENT

The Salmon National Forest encouraged active interagency and public involvement throughout the planning and analysis process for the Moyer Salt Timber Sale Final EIS. This chapter summarizes the public participation process, and includes:

1. A summary of public and interagency participation opportunities prior to the Final EIS;

2. A list of parties who attended the public scoping meeting in Salmon, Idaho, prior to the Draft EIS;

3. A list of parties who contributed information and views on the Draft EIS; and

4. A list of agencies, organizations and individuals who received copies of the Final EIS.

The Final EIS contains the letters and comments received in response to scoping on the Draft, and the Forest Service response to those comments. These are bound separately and distributed with the Final EIS document.

Scoping and Public and Interagency Participation Opportunities

The public has been involved in the analysis process for the Moyer Salt Timber Sale since the early planning stages. The public participation process used public concerns and insights to help resolve possible resource conflicts. Concerns and insights were documented and tracked through the analysis process (see Issues Analysis, Project File).

In early 1990 a letter was sent to all interested persons disclosing the intentions of the Cobalt Ranger District to schedule timber sales in this project area between 1991 and 1993. This letter requested a response from the interested parties if they had any concerns. A Notice of Intent was published in the Federal Register on July 6, 1990 that described the timber harvest and road construction activities that would be implemented under the proposed timber sale. A public meeting was held in Salmon, Idaho, on August 30, 1990 to present the proposed action to the public and to encourage public involvement in the scoping process. An announcement describing the public meeting was published beforehand in the Salmon Recorder Herald on August 25, 1990. Site-specific maps and resource data were provided to the public at this meeting to assist with pertinent and relevant discussion. Table VI-1 is a list of those who attended the public scoping meeting. The written comments and notes from these public meetings are available for review in the project file (see Open House Meeting, Project File).

Table VI-1 Individuals Who Attended the Public Meeting for the Moyer Salt Timber Sale DEIS

Gary Goodman	Salmon, Idaho
Tom Reiger	Salmon, Idaho
Hope Benedict	Salmon, Idaho
Donna Godfrey	Salmon, Idaho

During the scoping process, numerous topics were brought up as possible concerns relating to road construction and timber harvest. These topics were addressed by the forest staff of resource specialists. Based upon analysis the topics were either suggested to be further analyzed in the EIS or were dismissed as not appropriate for further analysis in this EIS. Topics that were recommended for further analysis in this EIS are described in Chapter II as issues and concerns. The decision to dismiss a topic from further analysis was based on whether there was a concern that a proposed management action may yield a noticeable effect to the human environment, would be highly controversial and would fall within the scope of this project level EIS. A complete listing of topics raised and the parties who brought them to the Forest Service attention can be found in the project file (Issue Analysis and Scoping, Project File).

Consultation With Other Agencies and with Organizations

Table VI-2 lists state and federal agencies (other than the Forest Service) and private organizations that contributed to the Draft EIS. Those listed contributed in the form of information and views, through telephone calls, letters, and meetings.

Table VI-2: Agencies and Organizations who Commented on the Notice of Intent

Agencies:
U.S. Department of Interior Fish and Wildlife Service, Boise, ID
U.S Environmental Protection Agency, Portland, OR
U.S. National Marine Fisheries Service, Portland, OR

Organizations:
Heritage North, Seattle, WA
Idaho Conservation League
Salmon Intermountain, Inc., Salmon, Id.

Comments and information received during formulation of the proposed action were used to create alternatives to the proposed action and to design mitigation measures to be implemented during project operation.

Consultation Between Draft and Final EIS

The Moyer Salt Timber Sale Draft EIS was published in the Federal Register on July 10, 1992. Approximately 100 copies of the Draft were distributed for public review starting on June 9, 1992. A 45 day formal public comment period followed this date.

Thirty-eight public comment letters were received during the formal comment period. They were analyzed and formed the basis of the FEIS revision.

Individual comments viewed as substantive were summarized and responded to by Forest Service personnel. Responses to all comment letters along with the original letter were bound separately and included in the final mailing of the FEIS and those requesting the Summary only.

Table VI-3 lists all individuals and organizations that responded to the Draft EIS.

Table VI-3: Agencies, Organizations and Individuals that responded to the Draft

Agencies:

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Lynne Stone
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James B.VanArk
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Guy Roberts
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Nelle Tobias
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The Major Geographical Sources of Comment Letters on the Draft EIS:

Number of Comments	*Geographical Area*
10	Local Area (includes Salmon, Gibbonsville, Carmen)
18	Other Idaho Communities
3	California
3	Oregon
2	Washington
1	Minnesota
1	Montana

The Major Issues Raised in the Comment Letters on the Draft EIS:

Number of Comments	*Issue Raised*
19	Travel/Access
2	Air Quality
4	New Alternatives Suggested
1	Cultural Resources
6	Economics
3	Ecosystem Management
5	Fisheries
12	Mistrust of Agencies Practices and Policies
3	Threatened, Endangered and Sensitive Specie
17	Range
1	Soil
7	Timber
7	Water Quality and Wetlands
32	Wildlife
11	Wilderness/Roadless

List of Agencies, Organizations and Individuals to Whom Copies of the Final EIS Were Sent

As part of the CEQ Regulations for implementing NEPA, the Forest Service is circulating the Final EIS for the Moyer Salt Timber Sale to the following agencies, organizations and individuals. Those receiving the Final EIS (Table VI-4) have 30 days to comment. Their comments should be as substantive as possible.

Table VI-4 List of Agencies, Organizations, and Individuals to Whom Copies of the Final EIS Were Sent

Agencies:

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Public Comment Letters and the Forest Service's Responses

Comment letters on the Draft EIS and the their responses are bound separately in Chapter IV - Supplement and is distributed with the Final EIS document.

Chapter VII

Literature Cited

CHAPTER VII
LITERATURE CITED

Allendorf, F.W. 1983. Isolation, gene flow, and genetic differentiation among populations. pp 51-65 in C.M. Schoenewald-Cox, S.M. Chambers, B. MacBryde, and W.L. Thomas eds. Genetics and conservation: a reference for managing wild animal plant populations. The Benjamin/Cummings Publishing Company, Inc., Menlo Park, CA.

Allen, K. R. 1969. "Limitations on Production in Salmonid Populations in Streams", In *Symposium on Salmon and Trout in Streams*, T. G. Northcote, ed., pp. 3-18. H. R. MacMillan Lectures in Fisheries. Univ. of British Columbia: Vancouver.

American Fisheries Society. 1991. *Influence Of Forest and Rangeland Management on Salmonid Fishes and Their Habitat*. William R. Meehan, Editor. American Fisheries Society Special Publication #19. Bethesda, Maryland.

Amman, Gene D., McGregor, Mark D., Cahill, Donn B., and Klein, William H. 1977. Guidelines for reducing losses of lodgepole pine to the mountain pine beetle in unmanaged stands in the Rocky Mountains; Intermountain Forest and Range Experiment Station, USDA Forest Service General Technical Report INT-36. 19 pp.

Anderson, H.A. 1982. *Aids to Determining Fuel Models for Estimating Fire Behavior*. U.S. Forest Service, General Technical Report INT-122, 1982.

Bloom, P., G. Steward and B. Walton. 1986. *The Status of the Northern Goshawk in California 1981-1983*. California Department of Fish and Game. Wildlife Administrative Branch Report 85-1. 26 pp.

Brookes, Martha, et al. 1985. Managing trees and stands susceptible to western spruce budworm. USDA Forest Service, Technical Bulletin No. 1695.

Burum, D., M. Sprague, and B. Lewis. 1990. *USDA Forest Service R4 Level I General Aquatic Wildlife Survey for the Salmon National Forest*. Unpublished data. Salmon National Forest Fisheries Files.

Burum, D., M. Sprague and B. Lewis. 1990. *USDA Forest Service Region 4, Salmon National Forest, GAWS Level I Stream Habitat Inventory*. USDA Forest Service: Salmon, Idaho.

Call, M.W. 1978, *Nesting habitats and surveying techniques for common western raptors*. U.S. Department of Interior Bureau of Land Management Technical Note TN-316.

Chapman, D. W. 1962. "Effects of Logging upon Fish Resources of the West Coast." *J. of Forestry*. 60(8): 533-537.

Chapman, D. W. 1966. "Food and Space as Regulators of Salmonid Populations in Streams." *American Naturalist*. 100: 345-357.

Clark, T.W., A.H. Harvey, R.D. Dorn, D.L. Genter and C. Groves, eds. 1989. *Rare, Sensitive and Threatened Species of the Greater Yellowstone Ecosystem*. Northern Rockies Conservation Cooperative, Montana Natural Heritage Program, The Nature Conservancy, and Mountain West Environmental Services. 153 pp.

Columbia River Basin Anadromous Fish, Policy Implementation Guide, Interagency Draft Agreement for Biological Assessments Cumulative Effects, November, 1992.

Connor, J.J. and K.V. Evans, 1986, *Geologic Map of the Leesburg Quadrangle, Lemhi County, Idaho*: Department of the Interior, U. S. Geological Survey

Council on Environmental Quality. November 29, 1978. *Regulations for Implementing the Procedural Provisions of the National Environmental Policy Act*. Title 40, Code of Federal Regulations, Parts 1500-1508 (40 CFR 1500-1508).

Crane, M.F.; Fischer, William C. 1986 Fire ecology of the forest habitat types of Central Idaho. General Technical Report INT-218, Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. 86 p.

Crocker-Bedford, D. 1990. Goshawk Reproduction and Forest Management. *Wildlife Society Bulletin* 18:262-269.

Evans, W. A. and F. B. Johnson. 1980. *Fish Migration and Fish Passage: A Practical Guide to Solving Fish Passage Problems*. U. S. Department of Agriculture Forest Service EM-7100-2, Washington, D. C.

Federal Register. 1991. *Endangered and Threatened Species: Proposed Threatened and Endangered Status for Snake River Spring and Summer Chinook Salmon*; Vol 56, No. 124, June 27, 1991, 50 CFR, Pt227.

Federal Register. 1991. *Endangered and Threatened Species: Proposed Endangered Status for Snake River Sockeye Salmon*; Vol. 56, No. 66, April 5, 1991, 50 CFR, Pt222.

Federal Register. 1991. *Endangered and Threatened Species: Endangered Status for Snake River Sockeye Salmon*; Vol. 56, No. 66, November 22, 1991, 50 CFR, Pt222.

Federal Register. 1992. *Endangered and Threatened Species: Threatened Status for Snake River Spring/Summer Chinook Salmon; Threatened Status for Snake River Fall Chinook Salmon*; Vol. 57, No. 78, April 22, 1992, 50 CFR, Pt227.

Fellin, David G.; Schmidt, Wyman C.; Carlson, Clinton E. 1984. Silvicultural Management Strategies for Pest of the Interior Douglas-Fir and Grand Fir Forest Types. Proceedings of a Symposium. Washington State University/Pacific Northwest Forest and Range Exp. Station, USDA Forest Service. pp. 81-92.

Firebaugh, G. May 8, 1991. Letter (2360/2430) Cultural Resource Comments on the Moyer Salt Timber Sale, Alternatives 2 and 3. USDA Forest Service, Salmon National Forest, Salmon, Idaho.

Firebaugh, G. January 31, 1991. Letter (2360/2430) Cultural Resources, Moyer Salt Timber Sale, Alternatives 2 and 3. USDA Forest Service, Salmon National Forest, Salmon, Idaho.

Forman, R.T.T. and M. Godron. 1986. *Landscape Ecology*. John Wylie and Sons.

Gilpin, M. E. and M. E. Soule. 1980. "Mimimum Viable Populations: Processes of Species Extinction." *In: Conservation Biology: The Science of Scarcity and Diversity*, pp. 19-33. Sunderland, Massachusetts: Sinauer Associates.

Goggans, R., R. Dixon and L. Seminara. 1988. Habitat Use by Three-toed and Black-backed Woodpeckers. Oregon Department of Fish and Wildlife, Non-game Report 87-03-02. 49 pp.

Graham, R.T., A.E. Harvey, M.F. Jurgensen, D.S. Page-Dumroese, J.R. Tonn, T.B. Jain, and K. Geier-Hayes. 1991." Sustaining Soil Productivity of Forest Soils in the Inland Northwest." U. S. Department of the Interior Forest Service, Intermountain Research Station: General Technical Report, Moscow, Idaho.

Greene, G. E. 1950. "Land Use and Trout Streams." *J. Soil and Water Conserv.* 5: 125-126.

Groves, C. 1989. *Idaho's Amphibians and Reptiles*. Non Game Wildlife Leaflet #7. Idaho Fish and Game, Non-game Program publication. Boise, Idaho. 12p.

Harvey, A. E., M. E. Jurgensen, M. J. Larsen and R. T. Graham. May, 1987. *Decaying Organic Materials and Soil Quality in the Inland Northwest: A Management Opportunity*. General Technical Report INT-225. USDA Forest Service, Intermountain Research Station: Ogden, UT.

Hayward, G. 1989. *Habitat Use and Population Biology of Boreal Owls in the Northern Rocky Mountains, U.S.A.* PhD Dissertations, University of Idaho. 113 pp.

Harris, L.D. 1984. *The Fragmented Forest*. University of Chicago Press. 211 pp.

Hornocker, M.G. and H.S. Hash. 1981. "Ecology of the Wolverine in Northwestern Montana." *Can. J. Zoo.* 59:1286-1301.

Hutchins, H. E. and R. M. Lanner. 1982. "The Central Role of Clark's Nutcracker in the Dispersal and Establishment of Whitebark Pine." *Oecologia* 55:192-201.

Idaho Department of Fish and Game. 1965. Inventory of Idaho Streams Containing Anadromous Fish, Including Recommendations for Improving Production of Salmon and Steelhead. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Contract Number 14-19-001-431. June 15, 1965.

Idaho Department of Fish and Game. 1991. *Fisheries Management Plan for the State of Idaho, 1991-1995.*

Idaho Department of Lands. 1990. *Rules and Regulations Pertaining to the Idaho Forest Practices Act. Title 38, Chapter 13, Idaho Code.* (IDAPA 20.15).

Jackson, G., and E.A. Rieffenberger, Feb. 5, 1992. Letter (2530/2430) Timber Sales BMP Implementation Monitoring. USDA Forest Service, Salmon National Forest, Salmon,Idaho.

Jones, S. 1979. "The Accipters - Goshawks, Cooper's Hawk, Sharp-shinned Hawk." *Habitat Management Series for Unique or Endangered Species*. Report #17. BLM Technical Note 335, Bureau of Land Management, Denver Service Center, Denver, Colorado.

Keen, F. P. 1936. Relative susceptibility of ponderosa pine to bark-beetle attack. Journal of Forestry 34:919-927.

Keystone Report. 1991. Biological Diversity on Federal Lands: Final Consensus Report of the Keystone Policy Dialogue on Biological Diversity on Federal Lands; The Keystone Center, Keystone, Colo. April, 1991, 96 p.

Kimble, L. A., and T. A. Wesche. 1975. "Relationship Between Selected Physical Parameters and Benthic Community Structure in a Small Mountain Stream." *Water Resource Research Institute Series*, No. 55. Univ. of Wyoming: Laramie. 64 pp.

Koehler, G. M. and J.D. Brittell. 1990. "Managing Spruce-fir Habitat for Lynx and Snowshoe Hares." *Journal of Forestry*. 88:10-14.

Koski, K. V. 1966. "The Survival of Coho Salmon (*Oncoryhnchus kisutch*) from Egg Deposition to Emergence in Three Oregon Coastal Streams." Oreg. State Univ.: Corvallis. 84 pp. (Master's Thesis)

Lemhi County Report, 1990, Robert Loucks, ed. University of Idaho Cooperative Extension Service, Salmon, Idaho.

Leopold, L., M. G. Wolman and J. P. Miller. 1964. *Fluvial Processes in Geomorphology*. W. H. Freeman Co.: San Francisco, CA. 522 pp.

Lotan, James E.; Perry, David A. 1983. Ecology and regeneration of lodgepole pine. Agriculture Handbook 606, USDA, Forest Service, 51 pp.

Lyon, L. J., and A. L. Ward. 1982. "Elk and Land Managment." In *Elk of North America, Ecology and Management*. eds., J. W. Thomas and D. E. Toweill, pp. 447-448. Stackpole Books: Harrisburg, PA. 698 pp.

May, B. 1985. "Process for Determining Resident Fish Capability in Forest Streams." Salmon National Forest Land and Resource Management Plan Working Paper #5. Salmon National Forest Fisheries Files: Salmon, ID.

McNiel, W. J., and W. H. Ahnell. 1964. *Success of Pink Salmon Spawning Relative to Size of Spawning Bed Materials*. U.S. Fish and Wildl. Serv. Spec. Sci. Rep. Fish. No. 469. 15 pp.

Meehan, W. R., F. J. Swanson and J. R. Sedell. 1977. "Influence of Riparian Vegetation on Aquatic Ecosystems with Particular Reference to Salmonid Fishes and their Food Supply." In *Importance, Preservation, and Management of Riparian Habitat: Proceedings of a Symposium; 1977, July 9, Tucson, AZ*. tech. coords. Johnson, R.R. and D.A. Jones, pp. 137-145. Gen. Tech. Rep. RM-43. U.S. Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: Fort Collins, CO. 1977.

Megahan, Walter F.1972. "Effects of Logging and Logging Roads on Erosion and Sediment Depostition from Steep Terrain." *Journal of Forestry*. 70 (3) 136-141.

Multiple Use - Sustained Yield Actod 1960, June 12, 1960. 74 Stat. 215, as amended: 16 USC 528-531.

National Environmental Policy Act of 1969, as Amended. Public Law 91-190, 42 U.S.C. 4321-4347, January 1, 1970, as amended by Public Law 94-52, July 3, 1975, and Public Law 94-83, August 9, 1975.

National Forest Management Act of 1976. October 22, 1976. Public Law 94-588. 94th Congress, S. 3091. Title 36, Code of Federal Regulations, Part 219 (36 CFR 219).

Northwest Power Planning Council. 1988. Anadromous Fish Presence/Absence Files for The Salmon River Basin.

Phillips, R. W. 1970. "Effects of Sediment on the Gravel Environment and Fish Production." In *Proceedings of Forest Land Uses and Stream Environments*, pp. 64-75. Oregon State University: Corvallis, Oregon.

Quinn, N. W. S., and G. Parker. 1987. "Lynx" pp. 682-694. *In: Wild Furbearers Management and Conservation in North America.* M. Novak, J.A. Baker, M.E. Obbard and B. Mallock, ed. Ontario Trappers Association/ Ministry of Natural Resources. Toronto, Ontario, Canada.

Ralphs, R. M., and working team. 1981. *Elk Habitat Relationships for Central Idaho.* A cooperative effort between USDA-Forest Service, Idaho Department of Fish and Game, Bureau of Land Management and University of Idaho. 57 pp.

Reiser, D. W. 1986. *Panther Creek, Idaho, Habitat Rehabilitation - Final Report.* BPA Project No. 84-29. Prepared for: U.S. Department of Energy, Bonneville Power Administration. Portland, OR. January, 1986.

Rieffenberger, E.A. December 10, 1990. Letter (2525/2430): Perreau Creek Timber Sale Monitoring Review. USDA Forest Service, Salmon National Forest, Salmon, Idaho.

Rieffenberger, E.A. July 12, 1991. Letter (2540/2470) Summarizing Soil and Water Best Management Practices for Silvicultural Activities. USDA Forest Service, Salmon National Forest, Salmon, Idaho.

Rose, R. 1989-1990. Personal observations of Robert Rose, Fishery Biologist, Salmon National Forest, of fish species presence and general macroinvertebrate community composition at Snake River Adjudication quantification sites during 1989-1990 field operations.

Rose, R. 1991. Personal observations of Robert Rose, Fishery Biologist, Salmon National Forest, of macroinvertebrate community compositions of upper Woodtick Creek and Goodluck Creek during field review of proposed Moyer-Salt Timber Sale.

Rosgen, D. L. 1978. "Prediction Techniques for Potential Changes in Sediment Discharge Due to Silvicultural Activities." ASCE Annual Meeting. Pittsburg, PA. 1978. 12 pp.

Rosgen, D. L. 1985. "A Stream Classification System." In *Riparian Ecosystems and their Management - Reconciling Conflicting Uses.* General Technical Report RM-120. Rocky Mountain Forest and Range Experiment Station, U.S. Department of Agriculture Forest Service: Fort Collins, CO. pp. 91-95.

Sestak, M.L., and A.R. Riebau. 1988. "Simple Approach Smoke Estimation Model "SASEM"; U.S. Bureau of Land Management, Wyoming State Office, Cheyenne, WY.

Shuster, W.C. 1983. *Northern goshawk nest site requirements in the Colorado Rockies.* Western Birds 11:89-96.

Simpson, J. C., and R. L. Wallace. 1982. *Fishes of Idaho.* University of Idaho Press. 238p.

Smith, B. 1993. Personal Communicaton. Discussions with Robert Rose concerning priorities for restoration of anadromous fish passage on Salmon National Forest streams.

Spahr, R., L. Armstrong, D. Atwood, M. Rath. 1991. *Threatened, Endangered, and Sensitive Species of the Intermountain Region.* USDA Forest Service, Intermountain Region.

Sprules, W. M. 1947. *An Ecological Investigation of Stream Insects in Algonquin Park, Ontario.* Univ. Toronto Studies. Biol. 56. Publ. Ont. Fish. Res. Lab. 69: 1-81.

Steele, Robert, R. D. Pfister, R. A. Ryker and J. A. Kittams. 1981. *Forest Habitat Types of Central Idaho.* USDA For. Serv. Gen. Tech. Rep. INT-114, Intermountain Forest and Range Experiment Station: Ogden, Utah. 138 pp.

Tackle, David 1961. Silvics of lodgepole pine. Misc. Publ. 19, rev., Ogden, UT: USDA Forest Service Intermountain Forest and Range Experiment Station. 24 pp.

Thomas, J. W., H. Black, Jr., R. J. Scherzinger, and R. J. Pederson. 1979. "Deer and Elk." In *Wildlife Habitats in Manged Forests - The Blue Mountains of Oregon and Washington.* ed., J.W. Thomas, pp. 104-127, USDA Handbook No. 533. Washington, D.C. 512 pp.

Towry, R. K. 1984. "Wildlife Habitat Requirements," pp. 73-210. *In: Managing Forested Lands for Wildlife.* R.L. Hoover and D.L. Wills, ed. Published by Colorado Division of Wildlife in cooperation with USDA Forest Service, Rocky Mountain Region, Denver, Colorado.

Troendle, C. A. 1982. "The Effects of Small Clearcuts on Water Yields from tha Deadhorse Watershed; Frasier, Colorado." In *Proceedings of the 50th Annual Meeting of the Western Snow Conference,* (Reno, Nevada; April 19-23, 1982), pp. 75-83. Colorado State University: Fort Collins, Colorado. 225 pp.

Troendle, C.A., and R.M. King. 1985. "The Effect of Timber Harvest on the Fool Creek Watershed, 30 Years Later." Water Resources Research 21, p. 1915-1922.

University of California. 1989-1990. Crocker Nuclear Laboratory, Davis, California; Report on SFU Sampler data for 1989, 1990 and 1991 for particle sampler site on South Baldy Mt., Salmon, Idaho.

U. S. Department of Agriculture Forest Service. 1973. *National Forest Landscape Management,* Volume 1. Agriculture Handbook Number 434. U. S. Government Printing Office: Washington, D. C.

U. S. Department of Agriculture Forest Service. 1974, reprinted in 1977. *National Forest Landscape Management,* Volume 2, Chapter 1, "The Visual Management System." Agriculture Handbook Number 462. U. S. Government Printing Office: Washington, D. C.

U. S. Department of Agriculture Forest Service. 1977. *National Forest Landscape Management*, Volume 2, Chapter 4, "Roads." Agriculture Handbook Number 483. U. S. Government Printing Office: Washington, D. C.

U. S. Department of Agriculture Forest Service. 1980. *National Forest Landscape Management*, Volume 2, Chapter 5, "Timber." Agriculture Handbook Number 559. U. S. Government Printing Office: Washington, D. C.

U. S. Department of Agriculture Forest Service. 1987. *Air Resource Management Handbook*. FSH 2509.19.

U. S. Department of Agriculture Forest Service. 1990. *Title 2500 - Watershed and Air Management*. Region 4 Supplement No. 75. Ogden, Utah.

U. S. Department of Agriculture Forest Service and Idaho Department of Health and Welfare Division of Environment. February 5, 1988. "Memorandum of Understanding."

U. S. Department of Agriculture Forest Service. 1992. *Project File for the Moyer Salt and Salt Creek Timber Sale Draft Environmental Impact Statement*. Salmon National Forest: Salmon, ID. (unpublished data, reports, letters, maps, etc.)

U. S. Department of Agriculture Forest Service. July 6, 1990. "Notice of Intent for the Moyer Salt and Salt Creek Timber Sale." *Federal Register*. Vol. 55, No. 190.

U. S. Department of Agriculture Forest Service. 1989. *Salmon National Forest Noxious Weed Control Program Environmental Assessment*. Salmon, ID.

U. S. Department of Agriculture Forest Service. 1988. *Land and Resource Management Plan for the Salmon National Forest*. Salmon National Forest: Salmon, ID.

U. S. Department of Agriculture Forest Service. 1988. *Salmon National Forest Travel Map*. Salmon National Forest: Salmon,Idaho.

U. S. Department of Agriculture Forest Service. 1988. *Land and Resource Management Plan for the Salmon National Forest, Final Environmental Impact Statement*. Salmon National Forest: Salmon, ID.

U. S. Department of Agriculture Forest Service. 1988. *Land and Resource Management Plan for the Salmon National Forest, Record of Decision*. Salmon National Forest: Salmon, Idaho.

U. S. Department of Agriculture Forest Service. 1988 *Moyer Salt Timber Sale Environmental Assessment*. Salmon National Forest: Salmon, ID.

U. S. Department of Agriculture Forest Service. 1989. *Our Approach: Forest Plan Implementation of Desired Future Condition (A Desk Reference)*. Northern Region Programming, Planning and Budgeting: Odgen, Utah.

U. S. Department of Agriculture Forest Service. 1976. "*The National Forest Management Act of 1976*." Current Information Report No. 16.

U. S. Department of Agriculture Forest Service. 1986. *Recreation Opportunity Spectrum Book*

U. S. Department of Agriculture Forest Service, 1978, Section III: Salmon Uplands Section Composition Book, Landtypes Inventory, and appendix material.

U. S. Department of Agriculture Forest Service. 1981. Soil Scientist Report, November, 1981

U.S. Department of Agriculture Forest Service. 1977. Water Resource Inventory of the Taylor Mountain Planning Unit. (unpublished data).

U.S. Department of Agriculture Fish and Wildlife Service. Letter, January 29, 1991. Threatened and Endangered Species List for the Moyer Salt Timber Sale Project.

U.S. Department of Agriculture Soil Conservation Service. 1975. "Soil Taxonomy: A Basic System of Soil Classification for Making and Interpreting Soil Surveys". Soil Survey Staff, USDA Department of Agriculture Handbook #436, p. XX.

United States Fish and Wildlife Service. 1987. *Northern Rocky Mountain Wolf Recovery Plan*. U.S. Fish and Wildlife Service. Denver, Colorado. 119 pp.

United States Fish and Wildlife Service. 1992. *Wolf Recovery in Yellowstone National Park and Central Idaho*. Alternative Scoping Report. US F&WS, Helena, Montana. 7p.

Waring, R.H.; Pitman, C.B. 1980. A simple model of host resistance to bark beetle attack. Res. Note 65, Forest Research Laboratory, Oregon State University, Corvallis, OR, 2 pp.

Westveld, M. 1954. A budworm vigor-resistance classification for spruce and balsam fir;Journal of Forestry, 52:11-24.

Wilcox, D. S. 1985. "Nest Predation in Forest Tracts and the Decline of Migratory Songbirds." *Ecology* 66: 1211-1214.

Yee, C. S., and T. D. Roelofs. 1980. "Planning Forest Roads to Protect Salmonid Habitat." In *Influence of Forest and Range-land Management on nadromous Fish Habitat in Western North America*. ed., W. Meehan. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service· Portland, Oregon.

GLOSSARY

A

Accelerated Soil Erosion - above-natural levels of soil erosion.

Access - usually refers to a road or trail route over which a public agency claims a right-of-way for public use; a way of approach.

Acre-foot - a unit of measurement equal to the volume which would cover one acre to a depth of one foot (i.e., 43,560 cubic feet).

Affected Environment - the natural, physical, and human-related environment that is sensitive to changes due to proposed actions; the environment under the administration of one line officer, such as District Ranger or Forest Supervisor.

Age Class - one of the intervals into which the age range of trees is divided for classification or use. Age class 1 = 0-39 years; class 2 = 40-79 years; class 3 = 80-119 years; class 4 = 120-159 years; class 5 = 160 years and up.

Airshed - a geographical area that, because of topography, meteorology, and climate, shares the same air.

Allotment Management Plan (AMP) - (see RANGE ALLOTMENT) the management plan by which areas are designated for the use of a prescribed number and kind of livestock. A document that specifies the actions to be taken to manage and protect the rangeland resources and reach a given set of objectives (FSM 2210).

Allowable Sale Quantity (ASQ) - the quantity of timber that may be sold from the area of suitable land covered by the Forest Plan for a time period specified by the Plan. This quantity is usually expressed on an annual basis as the "average annual allowable sale quantity."

Alternative - a mix of management prescriptions and land allocations applied to specific land areas to achieve a set of goals and objectives; one of several policies, plans, or projects proposed for decision making.

AMP - allotment management plan.

Anadromous Fish - those species of fish that mature in the sea and migrate into streams to spawn; i.e., salmon, steelhead.

Analysis area - one or more capability areas grouped for purposes of analysis; similar land area(s) of various sizes based on common impacts, effects, and social or economic factors.

Apparent Naturalness - one of the six roadless area characteristics and wilderness features, a condition of the environment when it looks natural to most people using the area. It is a measure of importance of visitors' perceptions of human impacts to the area. Even though some of the long-term ecological processes of an area may have been interrupted, the landscape of the area generally appears to be affected by the forces of nature. If the landscape has been modified by human activity, the evidence is not obvious to the casual observer, or it is disappearing due to natural processes.

B

Background - the distant part of a landscape, picture, or the visible terrain beyond the foreground and middleground where individual trees are not visible but blend into the total fabric of the timber stand (approximately three miles or more from the viewer).

Baseline - with respect to soils, the amount of erosion and sedimentation due to natural sources in the absence of human activity.

Below Cost - timber sales that cost more to prepare, sell, and administer than they return in revenue.

Benchmark - an analysis reference point of the maximum physical/biological capability to produce a resource output from Forest lands while maintaining minimum legal requirements for production of other resources and maintenance of soil and water productivity. Benchmarks define the area (i.e., provide the bounds) within which alternatives can be formulated.

Beneficial Water Uses - Uses of water from a stream, lake or reservoir that are considered beneficial. The Idaho Water Code defines those recognized by the State of Idaho.

Berm - an edge or shoulder running alongside a road, canal, etc.; any level strip of ground at the summit or sides, or along the base, of a slope.

Best Management Practice (BMP) - a practice or combination of practices determined by the state to be the most effective and practicable (including technological, economic and institutional considerations) means of preventing or reducing the amount of pollution generated by non-point sources to a level compatible with water quality goals. (see also Appendix D)

Big Game - those species of large mammals normally managed as a sport hunting resource.

Biological Diversity - the distribution and abundance of different plant and animal communities and species over time and space.

Biological Growth-potential - the average net growth attainable in a fully stocked natural forest stand.

Biota - the animal and plant life of a region or period. (see COLD WATER BIOTA, WARM WATER BIOTA)

BLM - Bureau of Land Management

Board Feet - the amount of wood equivalent to a piece of wood one foot by one foot by one inch thick. Generally, five board feet log measure is approximately equivalent to one cubic foot of round wood.

Buffer Strip - land area of varying size and shape immediately adjacent to stream courses or to water bodies on which the type and/or intensity of land use is tempered to meet defined water resource goals. (From: "An Approach to Water Resources Evaluation of Non-Point Silvicultural Sources," EPA-600/8-80-012).

Bureau of Land Management - federal land management organization operating under the Department of Interior.

C

Canopy - the more-or-less continuous cover of branches and foliage formed collectively by the crown of adjacent trees and other woody growth.

CEQ - Council on Environmental Quality

CFR - Code of Federal Regulations

Characteristic Landscape - the naturally established landscape within a scene or scenes being viewed.

Cirque Basin - the term in geomorphology for basins of semi-circular form found in the Pyrenees. They range in size from a few meters to several kilometers and occur at the head of glacial troughs. Also called valley head cirques.

Class I Stream - a perennial or intermittent stream which has one or more of the following characteristics: (1) is the direct source of water for domestic use (cities, recreation sites, etc.); (2) is used by large numbers of fish for spawning, rearing, or migration; (3) flows enough water to have a major influence on water quality of another Class I stream.

Class II Stream - a perennial or intermittent stream which has one or both of the following characteristics: (1) is used by moderate though significant numbers of fish for spawning, rearing, or migration; (2) flows enough water to have a moderate influence on downstream quality of a Class I or II stream.

Clearcut - the removal, in a single cut, of all trees in stands larger than seedlings.

Clearcutting - the cutting method that describes the silviculture system in which the old crop is cleared over a considerable area at one time. Regeneration then occurs from (a) natural seeding from adjacent stands, (b) seed contained in the slash or logging debris, (c) advance growth, or (d) planting or direct seeding. An even-aged forest usually results.

Climax - the highest ecological development of a plant community capable of perpetuation under the prevailing climactic and soil conditions.

Climax Species - those species that dominate a climaxed plant community.

Clone - (as in Aspen Clone) - aspen trees in clumps with one root system.

Code of Federal Regulations (CFR) - the listing of various regulations pertaining to management and administration of the National Forests.

Codominant (a crown class) - species in a mixed crop that are about equally numerous and vigorous; forming part of the upper canopy of a forest, less free to grow than dominants but freer than intermediate and suppressed trees.

Cold Water Biota - waters which are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species which have optimal growing temperatures below 18 degrees C.

Commercial Thinning - harvesting an immature stand to maintain or accelerate the growth of the remaining trees; also called an intermediate cut.

Community Stability - a community's capacity to handle change without major hardships or disruptions to component groups or institutions.

Community Type - a generalized category comprising a number of similar units or stands of vegetation such as a lodgepole pine or ponderosa pine plant community

Compaction - the packing together of soil particles by forces exerted at the soil surface, resulting in increased density; reduction of pore space and reduced infiltration of water

Concern (or subissue) - results from a concern that was voiced in a public or interdisciplinary team meeting; does not drive the development of an alternative, but will be disclosed for each alternative.

Condition Class - a grouping of timber stands into size-age-stocking classes for Forest planning.

Conifer - those cone-bearing trees, mostly evergreen, including the pine, spruce, fir, etc.

Cord - a unit of gross volume measurement for stacked roundwood based on external dimensions, generally implies a stack of four feet by four feet vertical cross section and eight feet long, contains 128 stacked cubic feet.

Corps of Engineers - a separate branch of the U.S. Army which has the responsibility of overseeing civil engineering projects, especially those concerned with waterways.

Corridor - a linear strip of land identified for the present or future location of transportation or utility rights-of-way within its boundaries.

Costs - the negative or adverse effects or expenditures resulting from an action. Costs may be monetary, social, physical or environmental in nature.

Cost Effectiveness - achieving specified outputs or objectives under given conditions for the least cost.

Cost Efficiency - the usefulness of specified inputs (costs) to produce specified outputs (benefits). In measuring cost efficiency, some outputs, including environmental, economic, or social impacts, are not assigned monetary values but are achieved at specified levels in the least cost manner. Cost efficiency is usually measured using present net value, although use of benefit/cost ratios and rates-of-return may be appropriate.

Council on Environmental Quality - An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.

Cover - vegetation, usually coniferous, that provides either thermal or hiding cover for wildlife.

Cover:forage Ratio - the ratio of cover (usually conifer types) to foraging areas (natural openings, clearcuts, etc.).

Creep - the slow movement downslope of soil and rock debris usually without water.

Critical Habitat - that habitat designated by the Secretary, USDI, as critical to the continued survival of threatened or endangered species.

Crown - the leaves or needles and living branches of a tree.

Crown Height - of a standing tree, the vertical distance from ground level to the base of the crown measured either to the lowest live branchwhorl or to the lowest live branch (excluding shoots arising spontaneously from buds on the stem of a woody plant) or to a point halfway between.

Crown Ratio - the ratio between the crown of a living tree and its total height, usually given as a percent.

Cubic Foot - the amount of timber equivalent to a piece of wood one foot by one foot by one foot.

Cull - any item of production; e.g., trees, logs, lumber, picked out for relegation or rejection because it does not meet certain specifications.

Cultural Resources - buildings, sites, areas, architecture, memorials, and objects having scientific, prehistoric, historic, or social values.

Cumulative Effect - the effect on the environment which results from the incremental effects of the action when added to other past, present, and reasonable foreseeable future actions regardless of what agency (federal or non-federal) or person undertakes such

other actions. Cumulative effects can result from individually minor but collectively significant actions taking place over a period of time (40 CFR 1508.7).

Current Direction - the combination of activities dictated by laws, regulations, the Forest Service Manual, and existing unit plans.

Cutslope - uphill side of a road built on a hill.

Cutting Cycle - the planned lapse of time between successive cutting in a stand.

D

DBH - Diameter at Breast Height; the diameter of a tree measured 4.5 feet above the ground.

Decision Criteria - essentially the rules or standards used to evaluate alternatives; measurements or indicators that are designed to assist a decision-maker to identify a preferred choice from the array of possible alternatives.

Decision-maker - the responsible official who chooses which alternative or proposal to follow on a proposed action.

Decking Areas - sites that are intermediate between stump and landing, used to collect logs.

Deferred Rotation Grazing - discontinuance of grazing on various parts of a range in succeeding years, allowing each part to rest successively during the growing season to permit seed production, establishment of seedlings, or restoration of plant vigor. Two, but usually three or more, separate grazing units are required. Control is usually insured by unit fencing, but may be obtained by herding on sheep ranges.

DEIS - draft environmental impact statement.

Desired Future Condition (DFC) - the physical changes which are anticipated to result from carrying out planned management practices at two points in time; at the end of ten years and at the end of fifty years.

Developed Recreation - recreation where facilities are provided, such as: roads, parking lots, picnic tables, toilets, drinking water, ski lifts, buildings.

Developed Recreation Site - relatively small, distinctly defined area where developed recreation facilities are provided for concentrated public use; e.g., campground, picnic areas, swimming areas.

Diameter at Breast Height - (DBH) the diameter of a standing tree measured at a point four feet-six inches from ground level on the uphill side.

Direct Effects - effects that are caused by an action and that occur at the same time and place.

Dispersal Corridor - a corridor through which animal populations move or distribute themselves throughout an area.

Dispersed Recreation - outdoor recreation in which visitors are diffused over relatively large areas. Where facilities or developments are provided, they are more for access and protection of the environment than for the comfort or convenience of the people.

Distance Zone - one of three categories used in the Visual Management System to divide a view into near and far components; used as a frame of reference in which to discuss landscape characteristics or activities of man. The three categories are: (1) foreground, (2) middleground, and (3) background.

Disturbed Area - the surface area affected by a logging/road building operation.

Diversity - the distribution and abundance of different plant and animal communities and species within the area covered by a Land and Resource Management Plan. (See also BIOLOGICAL DIVERSITY, VEGETATIVE DIVERSITY, STRUCTURAL DIVERSITY.)

Dominant (a crown class) - one of four main crown classes for forests recognized ona basis of relative status and condition in the crop. Dominant trees have their crowns in the uppermost layers of the canopy and are largely free-growing.

E

Economic Efficiency - a measure of how well costs achieve benefits when all costs and benefits are identified and valued.

Economic Impacts - *Direct economic impact:* effects caused directly by forest product harvest or processing or by forest uses. *Indirect economic impact:* effects that occur when supporting industries sell goods or services to directly affected industries. *Induced economic impact:* effects that occur when employees or owners of directly or indirectly affected industries spend their income within the economy.

Ecosystem - an interacting system of organisms considered together with their environment; for example, marsh, watershed, and lake ecosystems.

Ecotones - transition zones between two different plant communities, such as that between forest and sagebrush flat.

Effects - environmental consequences as a result of a proposed action. Included are direct effects, which are caused by the action and occur at the same time and place, and indirect effects, which are caused by the action and are later in time or further removed in distance, but which are still reasonable foreseeable. Indirect effects may include growth-inducing effects and other effects related related to induced changes in the pattern of land use,

population density, or growth rate, and related effects on air and water and other natural systems, including ecosystems.

Elk Habitat Potential (EHP) - a measurement of possible elk habitat using the measurements of cover:forage ratio, open road density, and calculating a percentage using these measures. It is the ratio of forested cover to open forage areas, dependent upon habitat type and open and closed road densities. A 100% EHP indicates a perfect balance between cover and forage in an unroaded area. The optimal cover:forage ratio for most habitat types is 40:60.

Endangered Species - any species of animal or plant that is in danger of extinction throughout all or a significant portion of its range. Plant or animal species identified by the Secretary of the Interior as endangered in accordance with the 1973 Endangered Species Act.

End-hauled - in road building, moving earth along the roadway from a through-cut to a through-fill.

Environment - the aggregate of physical, biological, economic, and social factors affecting organisms in an area.

Environmental Analysis - an analysis of alternative actions and their predictable environmental effects, including physical, biological, economic, and social consequences and their interactions; short- and long-term effects; direct, indirect, and cumulative effects.

Environmental Assessment (EA) - a concise public document which serves to (a) Briefly provide sufficient evidence and analysis for determining whether to prepare an EIS or a Finding of No Significant Impact; (b) Aid an agency's compliance with NEPA when no EIS is necessary; (c) Facilitate preparation of an EIS when necessary.

Environmental Impact Statement (EIS) - a detailed statement prepared by the responsible official in which a major Federal action which significantly affects the quality of the human environment is described, alternatives to the proposed action provided, and effects analyzed.

Ephemeral Reach - a stream segment which flows only briefly and in response to local precipitation, and whose channel lies above the level of the water table.

Ephemeral Stream - a stream that flows only as a direct response to rainfall or snowmelt events. It has no base flow.

Erosion - detachment or movement of soil or rock fragments by water,wind, ice, or gravity. Accelerated erosion is much more rapid than normal, natural or geologic erosion, primarily as a result of the influence of activities of man, animals, or natural catastrophes.

Even-aged Management - the application of a combination of actions that results in the creation of stands in which trees of essentially the same age grow together. Managed even-aged forests are characterized by a distribution of stands of varying ages (and, therefore, tree sizes) throughout the forest area. The difference in age between trees forming the main canopy level of a stand usually does not exceed 20 percent of the age of the stand at harvest rotation age. Regeneration in a particular stand is obtained during

a short period at or near the time that a stand has reached the desired age or size for regeneration and is harvested. Clearcut, shelterwood, or seed tree cutting methods produce even-aged stands.

Even-aged Silviculture - The combination of timber management actions that result in the creation of stands where trees of essentially the same age grow together.

Even-aged Stand - a timber stand where all the trees are the same age or at least of the same age class; a stand is considered even-aged if the difference in age between the oldest and youngest trees does not exceed 20 per cent of the length of the rotation.

Evaporation - the process by which water is changed from the liquid or solid state into the gaseous state through the transfer of heat. (see also EVAPOTRANSPIRATION)

Evapotranspiration - the process by which water is evaporated from wet surfaces and transpired by plants. (see also TRANSPIRATION)

F

FEIS - Final Environmental Impact Statement.

Fill Slope - earth excavated during road building using the side-cast method. Earth is taken out of a hillside (cut) and placed on the downhill side or fill slope to create a flat terrace.

Filter strip - a strip of vegetation that retards the flow of runoff water, causing deposition of transported material and thereby reducing sediment flow.

Fisheries Habitat - streams, lakes and reservoirs that support fish.

FLRMP - Forest Land and Resource Management Plan.

Forage - all browse and non-woody plants that are available to wildlife for grazing or harvested for feeding.

Forage Area - vegetated area with less than 60 percent combined canopy closure of tree and tall shrub (greater than seven feet in height). This includes the grass-forb, shrub and open sapling-pole stand conditions and may include some older stands that have been thinned. In a managed forest the primary forage areas are those that have had all or most of the forest canopy removed, i.e. clearcut or shelterwood units.

Forb - any herbaceous plant species other than those in the Gramineae (grasses), Cyperaceae (sedges), and Juncaceae (rushes) families; fleshy-leaved plants.

Foreground - a term used in visual management to describe the stand of trees immediately adjacent to the high-value scenic area, recreation facility, or forest highway

Forest Development Roads (and Trails) - a legal term for Forest roads or trails that are under the management of the Forest Service.

Forest Land - land at least 10 percent occupied by forest trees or formerly having had such tree cover and not currently developed for non-forest use. Lands developed for non-forest use include areas for crops, improved pasture, residential or administrative areas, improved roads of any width, and adjoining road clearing and powerline clearing of any width.

Forest Land and Resource Management Plan (FLRMP) - in this document, Salmon National Forest's Forest Plan.

Forest Plan - a program for the management of the National Forest's renewable resources. Each unit of the National Forest System is required by the National Forest Management Act to prepare a Forest Plan every ten to fifteen years.

Forest Supervisor - the official responsible for administering the National Forest System lands in a Forest Service administrative unit, which may consist of two or more National Forests or all the Forests within a state. He reports to the Regional Forester.

Forest System Roads - roads that are part of the Forest development transportation system, which includes all existing and planned roads as well as other special and terminal facilities designated as Forest development transportation facilities.

Fragmentation - is the process of breaking up ecosystems into partially or wholly isolated habitats. It contributes to the loss of biological diversity.

Fry - the life stage of salmonid fish species that refers to the juvenile fish which have either not emerged from the gravel or have recently emerged.

FSH - Forest Service Handbook.

FSM - Forest Service Manual.

Fuel-loading - the condition where amounts of burnable forest materials accumulate in an area, thus contributing to the fire hazard of that area.

Fuels - include both living plants and dead, woody vegetative materials which are capable of burning.

Full Bench - in road building, a type of road in which no fill is used; the road is completely cut from the hillside.

G

Game Species - any species of wildlife or fish for which hunting seasons and bag limits have been established, and which are normally harvested by hunters, trappers, and fishermen under State and Federal laws, codes, and regulations.

Goal - a concise statement that achieves a desired condition to be achieved sometime in the future. It is normally expressed in broad, general terms and is timeless in that it has no specific date by which it is to be accomplished. Goal statements form the principal basis from which objectives are developed.

Granitics - of, or pertaining to, or composed of granite or granite-like rock. Soils derived from this parent material.

Grazing Allotment - see RANGE ALLOTMENT.

Growing Season - the months of the year during which a species of vegetation grows.

Guideline - an indication or outline of policy or conduct; any issuance that assists in determining the course of direction in any planned action accomplishing a specific objective.

H

Habitat - the place where a plant or animal naturally or normally lives or grows.

Habitat Diversity - the distribution and abundance of different plant and animal communities and species within a specific area. (see also WILDLIFE HABITAT DIVERSITY)

Hiding Cover - vegetation that will hide 90 percent of an elk from the view of a human at a distance of 200 feet or less. The distance at which the animal is essentially hidden is called a "sight distance."

Hydrograph - a graphic representation of stage, discharge, velocity, or other properties of water flow with respect to time.

I

IDT - interdisciplinary team.

Implementation - those activities necessary to respond to the approved Land and Resource Management Plan (Forest Plan).

Indicator Species - a plant or animal species adapted to a particular kind of environment. Its presence is sufficient indication that specific habitat conditions are also present.

Indirect effects - environmental consequences caused by a proposed action but occurring later in time. Indirect effects may include growth-inducing effects and other effects inducing changes in land use, population density, growth rate and related effects on air, water, and other natural systems, including ecosystems.

Interdisciplinary Approach - the use of individuals representing two or more areas of knowledge and skills focusing on the same task, problem, or subject. Team member interaction provides necessary insight to all stages of the process.

Interdisciplinary Team (IDT) - the group of individuals with different training assembled to solve a problem or perform a task, in this case the EIS document. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem.

Intermittent Stream - a stream which flows only at certain times of the year when it receives water from springs or from some surface source such as melting snow in mountainous areas.

Interstitial Spaces - in this context, pertaining to small narrow spaces between soil particles; a measurement of soil types.

Irregular Shelterwood - a modification of a shelterwood cut in which some of the trees of the overwood are retained long after the seed cutting.

Irretrievable - applies to losses of production, harvest, or commitment of renewable natural resources. For example, some or all of the timber production from an area is irretrievably lost during the time an area is used as a winter sports site. If the use is changed, timber production can be resumed. The production lost is irretrievable, but the action is not irreversible.

Irreversible - applies primarily to the use of non-renewable resources, such as minerals or cultural resources, or to those factors that are renewable only over long time spans, such as soil productivity. Irreversible also includes loss of future options.

Issue - results from a concern determined in public or interdisciplinary team meetings; voices an unresolved conflict to be addressed by the planning process or EIS.

Issues, Concerns, and Opportunities (ICO) - a public issue is a subject or question of widespread public interest relating to management of the National Forest resources, as identified through public participation and addressed through the planning process. A management concern is an issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process. A management opportunity is a statement of general actions, measures, or treatments that addresses a public issue or management concern in a favorable way.

J-K

Jackpot - in a forest, a large accumulation of fuel that can occur naturally or as a by-product of timber harvest.

Key Elk Summer Range (KESR) - that portion of the summer elk range essential for the continuation of both the pre- and post-reproductive elk cycles.

Key Summer Range - that portion of the summer range essential for the continuation of the pre- and post-reproductive cycles for all wildlife species.

Key Winter Range - the portion of the year-long range where big game find food and/or cover during severe winter weather.

L

Land Class - the topographic relief of a unit of land. Land classes are separated by slope, which coincides with the timber inventory process. The three land classes used in the Forest Plan are defined by the following slope ranges: 0 to 35 percent; 36 to 55 percent; and, greater than 55 percent.

Landform - an area of land that is defined by its particular combination of bedrock and soils, erosion processes and climatic influences; the shape and configuration of units of land which cover approximately 30,000 acres.

Landing - any place where round timber is assembled for further transport, commonly with a change of method.

Landtype - a portion of the landscape resulting from geomorphic and climatic processes with defined characteristics having predictable soil, hydrologic, engineering productivity, and other behavior. Landtype is a small unit of the landform (such as cirque basin lands) which may cover 1-2000 acres. Landtype is the smallest unit that is mapped on the Salmon National Forest.

Large Woody Debris - large logs that divert floing water and influence the scour an deposition of sediment in forest streams. These logs also provide hiding/security cover for fish. Large woody debris is also left on the ground after harvest to protect regeneration and soil productivity.

Leasable Minerals - coal, oil, gas, phosphate, sodium, potassium, oil shale, sulphur, and geothermal steam.

Locatable Minerals - those hardrock minerals which are mined and processed for the recovery of metals. May include certain non-metallic minerals and uncommon varieties of mineral materials such as valuable and distinctive deposits of limestone or silica. May include any solid, natural inorganic substance occurring in the crust of the eart. except for the common varieties of mineral materials and leasable minerals.

Long-term Productivity - the redistribution of resources within the ecosystem into products used by humans.

Long-term Sustained Yield (LTSY) - the estimated timber harvest that can be maintained indefinitely over time, once all stands have been converted to a managed state under a specific management intensity consistent with multiple use objectives.

M

Mainstem Reach - a stream segment encompassing the primary channel of a drainage system; the stream segment of highest stream order within a defined drainage system.

Manage - in this context, to silviculturally treat a forest so it will remain a permanently productive source of goods and benefits to the public. The managed forest can be treated in one or a combination of the following: control of composition; control of stand density; restocking of unproductive areas; protection and salvage; control of length of rotation; facilitating the harvesting, management and use of the forest; and protection of site and indirect benefits.

Management Activity - an activity of man imposed on a landscape for the purpose of harvesting, traversing, transporting, or replenishing natural resources.

Management Area - an area composed of aggregate pieces of land (generally several to many analysis areas) to which a given management objective and prescriptions are applied.

Management Concern - an issue, problem, or a condition which constrains the range of management practices identified by the Forest Service in the planning process.

Management Direction - a statement of multiple use and other goals and objectives, along with the associated management prescriptions and standards and guidelines to direct resource management.

Management Indicator Species (MIS) - animals or plants selected for special attention in the Forest Plan or this document for one or more of three reasons. They may be: *Emphasis species* - species to be managed as key resources on the basis of identified issues, e.g., threatened, endangered, rare, sensitive, harvest, or special interest species; *Indicate special habitat conditions* - species that require special habitat such as snags, riparian, old-growth forest stands, etc.; and/or *Indicate cumulative forest ecosystem change* - generally species having large home ranges and requiring a diversity of habitats.

Management Intensity - a management practice or combination of management practices and associated costs designed to obtain different levels of goods and services.

Management Opportunity - a statement of general actions, measures, or treatments that addresses a public issue or management concern in a favorable way.

Management Practice - a specific action, measure, course of action or treatment.

Management Prescription - management practices and intensity selected and scheduled for application on a specific area to attain multiple-use and other goals and objectives.

Mass Erosion - movement of large masses of earth materials in response to gravity, either slowly or quickly. This includes: slumps (rotation of a soil block with small lateral displacement), debris avalanches (rapid, shallow movement of soil mantle and rock fragments),

landslides (sudden, downslope movement of earth and rock), and soil creep (slow, gradual, more or less continuous, permanent deformation of soil under gravitational stress).

Mass Failure - (also called wasting) massive, downslope movement of earth material by gravity.

Mass Instability - the condition exhibited by a massive section of earth suspected of being unstable and capable of mass failure.

Mature Timber - trees have attained full development, particularly height, and are in full seed production.

MBF - thousand board feet

Mean Annual Increment of Growth - the total increase of girth, diameter, basal area, height, or volume of individual trees, or a stand up to a given age divided by that age.

Mesic - of, pertaining to, or adapted to an environment having a balanced supply of moisture.

Middleground - the space between the foreground and the background in a landscape; the area located from 1/4 or 1/2 to 3-5 miles from the viewer.

Million Board Feet (MMBF) - a symbol to indicate 1,000,000 board feet of wood fiber volume, either in log form or after conversion into lumber.

MIS - Management Indicator Species

Mitigation - action to avoid, minimize, reduce, eliminate, compensate, or rectify the impact of a management practice.

MMBF - million board feet

Modification - a Visual Quality Objective meaning man's activity may dominate the characteristic landscape but must, at the same, utilize naturally established form, line, color, and texture. It should appear as a natural occurrence when viewed in foreground or middleground.

Mosaic Pattern - areas with trees and areas without trees occurring in interrupted sequences.

Multiple Use - the management of all the various renewable surface resources of the National Forest so that they are used in the combination that will best meed the needs of the American people. The concept also includes making the most judicious use of the land for some or all of these resources or related services over areas large enough to provide sufficient latitude for periodic adjustments in use to conform to changing needs and conditions. Some of the land will be used for less than all of the resources. There should be harmonious and coordinated management of the various resources, each with the other, without impairment of the productivity of the land. Consideration is given to the relative values of the various resources and not necessarily to the combination of uses that will give the greatest dollar return or the greatest unit output.

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N

National Environmental Policy Act (NEPA) of 1969 - an act to declare a national policy which will encourage productive and enjoyable harmony between man and his environment, to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of humanity, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality.

National Forest Management Act (NFMA) - a law passed in 1976 as an amendment to the Forest and Rangeland Renewable Resources Planning Act requiring the preparation of Regional Guides and Forest Plans and the preparation of regulations to guide that development.

National Forest Land and Resource Management Plan - a Plan developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, that guides all natural resource management activities and establishes management standards and guidelines for the National Forest System lands of a given National Forest.

National Forest System (NFS) Lands - National Forests, National Grasslands, or purchase units, and other lands under the management of the Forest Service, including experimental areas and Bankhead-Jones Title III lands.

Native Species - a plant or animal species that occurs indigenously in an area.

Natural Integrity - one of the six roadless area characteristics and wilderness features; explains the extent to which long-term ecological processes are intact and operating. Impacts to natural integrity are measured by the presence and magnitude of human-induced change to an area. Such impacts include physical developments (e.g. roads, utility rights-of-way, fences, lookouts, cabins), recreation developments, domestic livestock grazing, mineral developments, wildlife/fisheries management activities, vegetative manipulation, and fire suppression activities.

Natural Opening - a break in the forest canopy. A naturally-occurring area of bare soil, grasses, forbs, or shrubs located in a large area dominated by trees. Also included are created openings no longer suitable for timber production.

Natural Regeneration - the regeneration or reforestation of a site by natural means; it is obtained either from seedlings originating by natural seeding or from sprouts and other plants representing vegetative reproduction. Natural regeneration may or may not be preceded by site preparation.

NEPA - National Environmental Policy Act

NEPA Process - the procedures followed to produce a NEPA document (environmental assessment or environmental impact statement), an interdisciplinary process, mandated by the NEPA, which concentrates decision-making around issues, concerns, alternatives and the effects of alternatives on the environment.

NFMA - National Forest Management Act of 1976.

No-action Alternative - the most likely condition expected to exist in the future if current management direction were to continue unchanged.

Nongame - species of animals which are not managed as a sport hunting resource.

NTU - nephelometric turbidity units (see WATER TURBIDITY).

Notice of Intent (NOI) - written notice published in the *Federal Register* explaining the intent to prepare an environmental statement on a proposed action.

Noxious Weed - a plant species that is undesirable; conflicts, restricts, or otherwise causes problems with the management objectives.

O

Objective - a concise, time specific statement of measurable planned results that respond to pre-established goals. An objective forms the basis for further planning to define the precise steps to be taken and the resources to be used in achieving identified goals.

Off-road Vehicle (ORV) - a vehicle such as motorcycle, all-terrain vehicle, four-wheel drive vehicle, and snowmobile.

Old growth - an old-growth stand of trees designated in the Forest Plan to be retained as it is.

Old-growth - a stand of trees that is past full maturity and is starting to decay; the last stage in forest succession.

Old-growth Habitat - habitat for certain wildlife that is characterized by overmature coniferous forest stands with large snags and decaying logs.

Opportunity - see MANAGEMENT OPPORTUNITY.

ORV - off road vehicles.

Over-aged or Over-mature Stand - a timber stand that consists of trees that have attained full development (age class 3-5), particularly in height, and are declining in vigor, health, and soundness.

Overstory - that portion of the trees, in a forest of more than one story, forming the upper or uppermost canopy.

P

Parent Material - the underlying rock from which soil forms through a variety of weathering processes. Distinct vegetation communities are often a function of corresponding parent material variations which influence soil physical and chemical properties.

Partial Retention - a Visual Quality Objective which in general means man's activities may be evident but must remain subordinate to the characteristic landscape.

Peak Flow - the highest value of stream stage or flow attained during a flood.

Perched Water Table - water table above an impermeable bed underlain by unsaturated rocks of sufficient permeability to allow movement of ground water (*Dictionary of Geologic Terms - Revised Edition*, 1976, Anchor Press).

Perennial Stream - a stream which normally flows throughout the year.

Planning Period - the length of time that a Forest Plan is intended to be in effect; in this case, 10 years.

Plant Succession - the progressive changes in plant communities toward climax. Successional stages are stages or recognizable conditions of a plant community that occur during its development from bare ground to climax; for example, coniferous forests in the Moyer Salt area progress through six recognized stages: grass-forb; shrub-seedling; pole-sapling timber; immature timber; mature timber; old-growth timber.

Pole - trees of at least five inches in diameter at breast height (DBH), but smaller than the minimum utilization standard for sawtimber.

Pool - a portion of a stream with reduced current velocity, often with deeper water than surrounding areas and with a smooth surface.

Precommercial Thinning - the selective felling or removal of trees in a young stand,conducted to accelerate diameter growth on remaining trees, maintain a specific stocking density, and improve vigor and quality of remaining trees; conducted at an age before the trees are commercially merchantable.

Prescribed Fire - intentional application of fire, of either planned or unplanned ignitions, to accomplish certain planned objectives.

Prescriptions - management practices selected and scheduled for application on a specific area to attain goals and objectives.

Present Net Value (PNV) - the difference between discounted benefits and discounted costs.

Preservation - a Visual Quality Objective that states only ecological change occurs in an area.

Primary Contact Recreation - surface waters which are suitable for prolonged and intimate contact by humans or for recreational activities when the ingestions of small quantities of water is likely to occur. Such water include, but are not restricted to, those used for swimming, water skiing, or skin diving.

Primitive Recreation - a Recreation Opportunity Spectrum (ROS) designation for an area that is characterized by essentially unmodified natural environment of a size or location that provides the opportunity for isolation from sights and sounds of people. Motorized use within the area is normally not permitted.

Primitive Roads - roads constructed with no regard for grade control or designed drainage, sometimes by merely repeatedly driving over an area. These roads are single lane, usually with native surfacing and sometimes passable with 4-wheel-drive vehicles only, especially in wet weather. (see also TWO TRACK ROAD)

Programmed Harvest - timber scheduled for harvest for a specific time period.

Project Area - in this document, the specific area proposed for timber harvest.

Proposed Action - in terms of the National Environmental Policy Act, the project, activity, or decision that a Federal agency intends to implement or undertake.

Public Access - usually refers to a road or trail route over which a public agency claims a right-of-way for public use.

Public Issue - a subject or question of widespread public interest relating to management of the National Forest System.

Public Participation Activities - meetings, conferences, seminars, workshops, tours, written comments, response to survey questionnaires, and similar activities designed and held to obtain comments from the general public and specific publics about National Forest System land management planning.

Q-R

Quartzite - a granulose metamorphic sandstone rock consisting essentially of quartz; soils derived from this parent material.

Range - land producing native forage for animal consumption and lands that are revegetated naturally or artificially to provide forage cover that is managed like native vegetation, which are amenable to certain range management principles or practices.

Range Allotment - an area designated for the use of a prescribed number and kind of livestock under one management plan. (see also ALLOTMENT MANAGEMENT PLAN)

RARE II - Roadless Area Review and Evaluation II.

Rearing Habitat - the river or stream areas where juvenile salmonids must find food and shelter to survive for a period of time.

Reconstruction - activities performed on an existing road or other facility to restore it to a specified standard.

Record of Decision (ROD) - a document separate from but associated with a final Environmental Impact Statement which states the decision, identifies all alternatives, specifying which were environmentally preferable, and states whether all practicable means to avoid environmental harm from the alternative have been adopted, and if not, why not (40 CFR 1505.2).

Recreation Capacity - the number of people that can take advantage of the supply of a recreation opportunity during an established use period without substantially diminishing the quality of the recreation experience or the resources.

Recreation Opportunity Spectrum (ROS) - land delineations that identify possible combinations of recreation activities, settings, and experience opportunities, from Primitive to Urban, arranged along a continuum. Classes are *Primitive, Semi-primitive Non-motorized, Semi-primitive Motorized, Roaded Natural, Rural,* and *Urban*. These classes are defined separately under their alphabetical headings in this glossary.

Reforestation - the natural or artificial restocking of an area with forest trees.

Regeneration - the renewal of a tree crop, whether by natural or artificial means; also the young tree crop (seedlings and saplings) itself.

Regional Ecosystems - large areas that encompass many biological communities and land management regimes and are identifiable by climate, landform, soils, and landscape patterns.

Regional Forester - the official responsible for administering a single Forest Region.

Release - all work done to free desirable trees from competition with other less desirable vegetation.

Release Cutting - frees a young stand of desirable trees not past the sapling stage from the competition of undesirable trees that threaten to suppress them. A *cleaning* is a form of release cutting that removes trees the same age as the young stand. A *liberation* cutting is a form of release that removes older, larger trees that overtop a more desirable, younger stand.

Remoteness - one of the six roadless area characteristics and wilderness features which is a perceived condition of being secluded, inaccessible, and out of the way. The physical factors that can create "remote" settings include topography, vegetative screening, distance from human impacts such as roads and logging operations (sight and sound), and difficulty of travel. A user's sense of remoteness in an area is also influenced by the presence or absence of roads, their condition, and whether they are open to motorized vehicles.

Removal Cut (final cut) - the removal of the last seed bearers or shelter trees after regeneration is established under a shelterwood method.

Research Natural Area - (also RESEARCH NATIONAL AREA) an area in as near a natural condition as possible which exemplifies typical or unique vegetation and associated biotic, soil, geologic, and aquatic features. The area is set aside to preserve a representative sample of an ecological community primarily for scientific and educational purposes; commercial and general public use is not allowed.

Resident Fish - those species of fish which do not go to sea to mature.

Residual Stand - the trees remaining standing after some event such as selection cutting.

Responsible Official - the Forest Service employee who has been delegated the authority to carry out a specific planning action.

Retention - a Visual Quality Objective specifying that activities are not evident to the casual forest visitor.

Riffle - a shallow section of a stream with rapid current and a surface broken by gravel, rubble, or boulders.

Riparian - of, pertaining to, situated, or dwelling on the bank of a river or other body of water.

Riparian Area or Habitat - streams, lakes, ponds, wetlands, flood plains, and their associated aquatic and riparian ecosystems.

Riparian Ecosystem - a transition between the aquatic ecosystem and adjacent upland terrestrial ecosystem; identified by soil characteristics and distinctive vegetation communities that require free or unbounded water.

Riprap - a quantity of broken stone for embankments; a foundation or wall of stones thrown together irregularly.

Road Maintenance Levels - levels are described as follows: *Level 1* - Road normally closed to vehicle traffic. *Level 2* - Road open for limited passage of traffic but not normally suitable for passenger cars. *Level 3* - Road open for public traffic including passenger cars, but may not be smooth or comfortable. *Level 4* - Road suitable for all types of vehicles, generally smooth to travel, and dust may be controlled. *Level 5* - Road is smooth and dust free, and the surface is skid resistant if paved.

Roaded Natural - Recreation Opportunity Spectrum (ROS) classification for trails or roads; frequency of contact is moderate to high on roads, low to moderate on trails and away from roads (specific numbers must be developed to meet regional or local conditions.)

Roadless Area Review and Evaluation II (RARE II) - the national inventory of roadless and undeveloped areas within the National Forests and Grasslands. This refers to the second such assessment, which was documented in the Final Environmental Impact Statement of the Roadless Area Review and Evaluation, January 1979.

Rotation - the planned number of years required to establish (including the regeneration period) and grow timber crops to a specified condition or maturity for regeneration harvest. Selected management prescriptions in the Forest Plan provide the basis for the rotation age.

S

Salmonid - member of the fish family *salmonidae*; includes salmon and trout.

Salmonid Spawning Areas - waters which provide or could provide a habitat for active self-propagating populations of salmonid fishes.

Salvage - removal of recently-dead or dying trees to minimize the loss of wood products.

Saplings - live trees less than 5 inches in diameter at breast height. Young trees.

Sawtimber - live trees that are nine inches DBH or larger and that can be used for timber.

Scarification - the process by which the upper layers of soil is loosened and exposed and vegetation is removed that would hinder seeding development

Scoping - the procedures by which the Forest Service determines the extent of analysis necessary for a proposed action; for example, the range of actions, alternatives, and impacts to be addresses, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed. *External scoping* refers to the process of receiving input from individuals outside the Forest Service, and *internal scoping* refers to the process of receiving input from individuals inside the Forest Service.

Secondary Contact Recreation - surface waters which are suitable or intended to be made suitable for recreational uses on or about the water and which are not included in the primary contact category. These waters may be used for fishing, boating, wading, and other activities where ingestion of raw water is not probable.

Sediment - Soil or rock particles that have been transported to stream channels or other bodies of water.

Sedimentation - the process of transporting sediment to stream channels or other bodies of water.

Seed Cut (also SEED TREE CUTTING) - similar to clearcutting, except that a few of the better trees of the desired species are left scattered over the area to provide seed for regeneration.

Seedlings - live trees less than 5 inches in diameter at breast height. Young plants grown from seeds.

Seed Tree - a tree selected, and often reserved, for seed collection.

Selected Alternative - the alternative recommended for implementation as the timber sale based on the evaluation completed in the planning process.

Semi-primitive Motorized - Recreation Opportunity Spectrum (ROS) classification for trails or roads with low to moderate contact frequency; characterized by a predominantly unmodified natural environment in a location that provides good to moderate isolation from sights and sounds of man except for facilities or travel routes sufficient to support motorized recreational travel opportunities which present at least moderate challenge, risk, and a high degree of skill testing.

Semi-primitive Non-motorized - Recreation Opportunity Spectrum (ROS) classification for trails or roads; usually 6-15 parties per day encountered on trails and 6 or less visible at campsites. It is characterized by a predominantly unmodified natural environment of a size and location that provides a good to moderate opportunity for isolation from sights and sounds of man. The area is large enough to permit overnight foot travel within the area, and presents opportunity for interaction with the natural environment with moderate challenge, risk, and use of a high degree of outdoor skills.

Sensitive Species - those plant or animal species which are susceptible or vulnerable to activity impacts or habitat alterations.

Sensitivity Level - a particular degree of measure of viewer interest in scenic qualities of the landscape. Three sensitivity levels are employed, each identifying a different level of user concern for the environment.

Level 1 - Highest sensitivity
Level 2 - Average sensitivity
Level 3 - Lowest sensitivity

Shelterwood - a method of regeneration of forest stands in which the mature timber is removed in a series of cuttings, which extend over a relatively short portion of the rotation, by means of which the establishment of essentially even-aged reproduction under the partial shelter of seed trees is encouraged. The first cutting is ordinarily the seed cutting, and the last is the final cutting. Any intervening cutting is termed removal cutting (from *The Practice of Silviculture*, Smith, 1962). (See Appendix H for more information.)

Shelterwood Cutting - the removal of all trees in a series of two or more cuts over a period of not more than 30 years.

Sidecast Materials - in road building, the materials excavated from a hillside and placed on the downhill side to create a flat terrace.

Sight Distance - the distance at which 90 percent or more of a deer or elk is hidden from an observer. Hiding cover exists when 90 percent or more of a standing deer or elk is hidden at a distance of 200 feet or less.

Silviculture - the are and science of growing and tending forest vegetation; for example, controlling the establishment, composition, and growth of forests for specific management goals.

Silvicultural System - a management process whereby forests are tended, harvested, and replaced, resulting in a forest of distinctive form. Systems are classified according to the method carrying out the fellings that remove the mature crop and provide for regeneration, and according to the type of forest thereby produced.

Site-specific - refers to a specific area or site; not intended to encompass a large area.

Site Productivity - production capability of specific areas of land.

Skidding - a loose term for hauling loads by sliding, not on wheels, as developed originally from stump to roadside, deck, skidway, or other landing.

Skid Trails - tracks where tractors slide or pull logs from the stumps to the roadside or log landings.

Slash - woody material left after logging, pruning, thinning, brush cutting, or other management activities. Slash may also accumulate as a result of storm, fire or other damage.

Slope Distance - walking distance down or up a slope. Vertical distance is the elevation change, and the horizontal distance is the "as the crow flies" distance.

Snag - a standing dead tree at least 6" DBH and at least 20 feet tall.

Soil Compaction - reduction of soil volume which results in alteration of soils, chemical and physical properties.

Soil Productivity - the capacity of a soil to produce a specific crop such as fiber, forage, etc., under defined levels of management. Productivity is generally dependent on available soil moisture and nutrients, length of growing season, and compaction.

Soil Survey - the systematic examination of soils in the field and in laboratories. There are five classes or orders of surveys with order 1 being the most intensive and order 5 being the least intensive.

Solifluction - the slow flowing downslope of masses of rock debris.

Solitude - one of the six roadless area characteristics and wilderness features; it is a personal, subjective value defined as isolation from the sight, sound and presence of others and the developments of man. Common indicators of solitude are numbers of individuals or parties one may expect to encounter in an area during a day, or the number of parties camped within sight and sound of other visitors.

Special Features - those unique geological, biological, ecological, cultural or scenic features that may be located in roadless areas.

Species - organisms that successfully reproduce among themselves and cannot reproduce successfully with other organisms.

Species Diversity - the distribution and abundance of different plant and animal communities and species.

Species of Special Concern - a native species whose population is low and limited in distribution or has suffered significant reductions because of habitat loss.

Story - in silviculture, one level of a forest stand; for example, canopy, understory, overstory.

Stream Class - the classification of streams according to their beneficial uses. Whole streams or parts of streams can be classified. One stream may be divided into several classes. (see also CLASS I STREAM, CLASS II STREAM, CLASS III STREAM, CLASS IV STREAM)

Stream Protection Zone (SPZ) - zone bordering both sides of a stream that is designed by IFPA to protect water quality. *Class I SPZ* is the area encompassed by a slope distance of 75 feet on each side of the ordinary highwater marks. Class I streams are used for domestic water supply or are important for the spawning, rearing, or migration of fish. Such waters shall be considered to be Class I upstream from the point of domestic diversion for a minimum of 1,320 feet. *Class II SPZ* is the area encompassed by a slope distance of at least 5 feet above the ordinary high water mark on each side of the stream. Class II streams are usually headwater streams or minor drainages that are used by only a few, if any, fish for spawning or rearing. Their principle value lies in their influence on water quality or quantity downstream in Class I streams.

Steelhead - a large-sized, silvery anadromous rainbow trout.

Structural Diversity - diversity in a forest stand that results from layering or tiering of the canopy; an increase in layering or tiering lends to an increase in structural diversity.

Stumpage - price paid for timber; usually expressed as dollars per thousand board feet ($/MBF).

Subordinate - inferior to or placed below another in size, brightness, etc.; secondary in visual impact.

Substrate - subsoil.

Substrate Permeability - a measure of the rate at which a substrate can pass water, the rate depending on substrate composition and compaction; the apparent velocity per unit of hydraulic gradient expressed in cm/hr.

Succession - (see Plant Succession).

Sustained Yield - the achievement and maintenance in perpetuity of a high-level annual or regular periodic output of the various renewable resources of the National Forest System, without impairment of the productivity of the land.

T

T & E - an abbreviation for Threatened and Endangered Species.

Target Population - the population levels of wildlife species established in the Forest Plan that will be managed for

Temporary Road - a road that will be physically obliterated and seeded after its primary use is completed; for example, a spur road for logging. It will never be used again.

Thermal Cover - vegetation used by animals to modify the adverse effects of weather; a forest stand that is at least 40 feet in height with tree canopy cover of at least 70 percent.

Thinning - a felling of trees made in an immature stand primarily to maintain or accelerate diameter increment growth and also to improve the average form of the remaining trees without permanently breaking the canopy; an intermediate cutting.

Thousand Board Feet (MBF) - a symbol to indicate 1000 board feet of wood fiber volume, either in log form or after conversion into lumber.

Threatened Species - any species of plant or animal which is likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Through-cut - in road building, where the road is being built on very steep slopes and on ridge points, the road is created by excavating the entire road width.

Through-fill - in road building, where a road is being built across a deep draw or swampy area, the whole road is made by placing earth over the natural ground. This is called a through-fill.

Tiering - refers to the coverage of general matters in broader EIS's (such as national program or policy statements) with subsequent narrower statements or environmental analyses (such as regional program statements or ultimately site-specific statements) incorporating by reference the general discussions and concentrating solely on the issues specific to the statement subsequently prepared.

Timber Base - the lands within the Forest that are capable, available, and suitable for timber production (same as suitable timberland)

Timber Stand Improvement (TSI) - measures such as thinning, pruning, release cutting, prescribed fire, girdling, weeding, etc., of unwanted trees with the objective of improving growing conditions of the remaining trees.

Timber Unit - a specified number of timberland acres marked for a proposed site-specific timber sale.

Total Soil Resource Commitment - reducing the growing capability of a site to 0 to 40 percent of its natural ability for 50 years or more

Transpiration - the evaporation of water absorbed by a crop . . . and used directly in the building of plant tissue, in a specified time. It does not include soil evaporation (Ven, 1964).

Transportation Corridor - a strip of land of variable width designated to accommodate the clearing and access control of a state or federal highway.

TSI - timber stand improvement.

Turbidity - murkiness in water due to stirred up sediment.

Two-track Road - primitive road.

U

Understory - the trees and other woody species growing under a more-or-less continuous cover of branches and foliage formed collectively by the upper portion of adjacent trees and other woody growth; the bottom story of a timber stand, usually shaded by trees forming the overstory or canopy.

Uneven-aged Management - the application or a combination of actions needed to simultaneously maintain continuous high-forest cover, recurring regeneration of desirable species, and orderly growth and development of trees through a range of diameter or age classes to provide a sustained yield of forest products. Cutting is usually regulated by specifying the number or proportion of trees of particular sizes to retain within each area, thereby maintaining a planned distribution of size classes. Cutting methods that develop and maintain uneven-aged stands are single-tree and group selection. (See Appendix H for more information.)

Uneven-aged Stand - a timber stand which contains at least three age classes intermingled intimately on the same area (From *The Practice of Silviculture*, Smith, 1962).

Ungulate - hoofed mammals; i.e. cattle, sheep, deer, elk, etc.

United States Geologic Survey (USGS) - federal government agency under the Department of Interior responsible for making topographical maps and doing geological research in the United States.

USGS - United States Geologic Survey.

V

Vegetative Diversity - the distribution and abundance of different plant communities and species within the area covered by a Land and Resource Management Plan.

View - something, especially a broad landscape or panorama, that is looked toward or kept in sight; the act of looking toward this object or scene.

Viewshed - everything that feeds into view you're seeing from a specific point; a total landscape seen or potentially seen from specific points on a logical part of a travel route or water body.

Vista - a confined view, especially one seen through a long passage, as between rows of houses or trees. A vista is often toward, or focuses upon a specific feature in the landscape. Unlike a view, the vista is sometimes man created and, if it is, thereby subject to design.

Visual Resource - the composite of basic physiographic features and patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

Visually Subordinate - secondary in visual impact.

Visual Quality Objective (VQO) - a desired level of excellence based on physical and sociological characteristics of an area; refers to degree of acceptable alteration of the characteristic landscape. VQO's are *Preservation, Retention, Partial Retention, Modification, and Maximum Modification.* (They are defined alphabetically in this glossary.)

W

Warm Water Biota - waters which are suitable or intended to be made suitable for protection and maintenance of viable communities of aquatic organisms and populations of significant aquatic species which have optimal growing temperatures of above 18 degrees C.

Water-barred - in road building, the process of placing water bars or small raised bumps across the width of a road for the purpose of channeling runoff water off the road.

Water Quality - refers to a set of chemical, physical, or biological characteristics that describe the condition of a river, stream, or lake. The quality of water determines which beneficial uses it can support. Different instream conditions or levels of water quality are needed to support different beneficial uses.

Watershed - all of the land that drains surface water to a given stream above a designated point (usually its mouth); also called a stream drainage or drainage basin.

Water Yield - the measured output of the Forest's streams.

Water Turbidity - a measure of the extent to which the intensity of light passing through is reduced by suspended matter; in this context, amount of clearness or murkiness in water due to stirred-up sediment.

Wilderness - all lands included in the National Wilderness Preservation System by public law; generally defined as undeveloped federal land retaining its primeval character and influence without permanent improvements or human habitation.

Wildfire - any wildland fire that is not a prescribed fire.

Wildlife Habitat Diversity - the distribution and abundance of different plant and animal communities and species within a specific area.

Winter Range - an area used by deer and elk during the winter months; usually at lower elevation and/or south and west exposures.

X, Y, Z

Yarding - the operation of hauling timber from the stump to a collecting point.

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APPENDIX A

NATIONAL MARINE FISHERIES SERVICE SPECIES LIST CONCURRENCE LETTERS

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
ENVIRONMENTAL & TECHNICAL SERVICES DIVISION
911 NE 11th Avenue - Room 620
PORTLAND, OREGON 97232
503/230-5400 FAX 503/230-5435

MAY 11 1992

F/NWO3

Mr. Robert W. Rose, Fishery Biologist
U.S. Forest Service
Salmon National Forest
P.O. Box 729
Salmon, Idaho 83467

RE: Moyer - Salt Timber Sale; Big Eightmile Timber Sale; Deer Creek Timber Sale

Dear Mr. Rose:

The National Marine Fisheries Service has reviewed the April 6 and 7, 1992, letters and their attached maps and data sheets regarding the occurrence of threatened and endangered species that are listed under the Endangered Species Act within the subject timber sales. We appreciate the completeness of the information you provided. Based on the available information, the National Marine Fisheries Service concurs with your species lists that indicate the occurrence of Snake River spring/summer chinook salmon within some drainages of the subject timber sales. We do not expect to find either Snake River sockeye salmon or Snake River fall chinook salmon within the drainages of the subject timber sales. We understand that the Forest Service is preparing a separate biological assessment for each timber sale and that each Biological Assessment will include information that will add to the accuracy of the species list.

Please contact Edmond Murrell, of my staff, at (503) 230-5433 if you have questions regarding our listing concurrence.

Sincerely,

Merritt E. Tuttle
Division Chief

cc: Lynn Bennett - Salmon National Forest
Lois Hill - Salmon National Forest

UNITED STATES DEPARTMENT OF COMMERCE
National Oceanic and Atmospheric Administration
NATIONAL MARINE FISHERIES SERVICE
ENVIRONMENTAL & TECHNICAL SERVICES DIVISION
911 NE 11th Avenue - Room 620
PORTLAND, OREGON 97232
503/230-5400 FAX 503/230-5435

APR 15 1993

APR - 1 1993

F/NWO3

Mr. Gordon Haugen
Columbia River Basin/Pacfish Coordinator
U.S. Forest Service
P.O. Box 3623
Portland, Oregon 97204

RE: Notice of Listed or Proposed Species and Designated or Proposed Critical Habitat (2610/2670)

Dear Mr. Haugen:

The National Marine Fisheries Service (NMFS) has reviewed your March 8, 1993, letter (enclosed) regarding the present distribution of threatened and endangered species listed or proposed for listing by NMFS under the Endangered Species Act. NMFS concurs with the information contained in the table entitled "Present Distribution of Threatened and Endangered Species" that was attached to your March 8 letter.

This species list can be used for all consultations that are not major construction activities requiring an environmental impact statement, in which case a separate request for a species list would be necessary pursuant to 50 CFR 402.12. Please direct any further questions regarding this project to Jeffrey Lockwood, of my staff, at (503) 231-2339.

Sincerely,

Merritt E. Tuttle
Division Chief

Enclosure

APR 14 '93

NOAA

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United States Department of Agriculture
Forest Service
Pacific Northwest Region
P.O. Box 3623
Portland, OR 97208-3623
333 S.W. First Avenue
Portland, OR 97204

Reply To: 2610/2670

Date: March 8, 1993

NOAA-NMFS RECEIVED MAR 11 1993 NORTHWEST REGIONAL OFFICE

Mr. Rolland Schmitten
National Marine Fisheries Service
7600 Sand Point Way, NE
Seattle, WA 98115-0700

Dear Mr. Schmitten:

Requirements of 50 CFR Part 402.12(c) call for federal agencies to secure either 1.) a current listing of threatened, endangered or proposed species and designated or proposed critical habitat from the NMFS, or 2.) provide a written notice of listed or proposed species and designated or proposed critical habitat. It further provides that the Director of NMFS shall either concur with the provided list or, if necessary, revise the list.

In order to efficiently meet these requirements a list of threatened and endangered species is enclosed, with occurrence listed by National Forest. Each forest, where occurrence is indicated, will have the responsibility of addressing that species in all biological evaluations or assessments.

Please review the enclosed list and, if you find it accurate, provide a written letter of concurrence as soon as possible. With your concurrence, the Forests will use this list for project level analysis until March 1994, for projects not requiring an Environmental Impact Statement (EIS). Forests will requiest a species list from your office for all projects and programs requiring an EIS.

If you have questions please do not hesitate to call.

Sincerely,

MAR 17 1993

GORDON HAUGEN
Columbia River
Basin/Pacfish Coordinator

Enclosure

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Present Distribution of Threatened and Endangered Species

NATIONAL FOREST	Snake River Basin Spring/Summer Chinook		Snake River Basin Fall Chinook		Snake River Basin Sockeye Salmon	
	*SRM Habitat	Migration Only	SRM Habitat	Migration Only	SRM Habitat	Migration Only
Bitterroot						
Boise	S/M Forks Salmon R. and tributaries					
Challis	Mainstem Salmon R. & tributaries					Mainstem Salmon River
Clearwater**						
Columbia Gorge Nat'l Scenic Area		Columbia River		Columbia River		Columbia River
Nez Perce**	Snake and Salmon Rivers & tributaries		Snake River and tributaries			Mainstem Snake and Salmon Rivers
Payette	Snake and Salmon Rivers & tributaries					Mainstem Salmon River
Salmon	Mainstem Salmon River & tributaries					Mainstem Salmon R.
Sawtooth	Mainstem Salmon River & tributaries				***	Mainstem Salmon River
Umatilla	Grande Ronde, Tucannon, Asotin Cr. & tributaries					
Wallowa-Whitman	Grande Ronde, Imnaha and tributaries	Snake River	Snake River			Mainstem Snake River

*SRM - Spawning, Rearing, and Migration

**Fall chinook salmon and proposed critical habitat for this species does not occur on NFS lands in the Clearwater Basin. However, FS management on tributaries to the Clearwater River may impact fall chinook habitat off the Forest. The Clearwater and Nez Perce NF's will evaluate management on these tributaries. If a may affect determination is made, the Forest will initiate consultation.

*** Alturas, Pettit, Redfish, Stanley, and Yellow Belly Lakes, (including their inlet and outlet creeks), Alturas Lake Creek and Valley Creek.

APPENDIX B

BEST MANAGEMENT PRACTICES FOR SOIL AND WATER

FEDERAL CONSISTENCY CHECKLIST

APPENDIX B1
SUMMARY OF SOIL AND WATER BEST MANAGEMENT PRACTICES (BMP'S) FOR SILVICULTURAL ACTIVITIES

The following compilation of best management practices was prepared by Betsy Rieffenberger, Salmon National Forest Hydrologist, to incorporate the April 1990 Idaho Forest Practices Act revisions.

This document is intended to serve as a brief summary of the BMP's for silvicultural activities contained in the Forest Plan and in the Idaho Forest Practices Act. Though not a comprehensive compilation of all the BMP's contained in these documents this summary should be useful for District personnel involved in timber sale preparation. The reference for the BMP is contained in parentheses with the abbreviation for the Forest Plan (FLRMP) or the Idaho Forest Practices Act (IFPA). Copies of the Forest Plan, Idaho Forest Practices Act are located in the Project File. Further direction is also contained in the Forest Service Manual (FSM 2505.1); a copy is available for review at the Supervisor's Office in Salmon.

1. GENERAL TIMBER HARVESTING

a. "Conduct nonpoint source activities in accordance with applicable Best Management Practices as referenced in "Idaho Water Quality Standards and Wastewater Treatment Requirements" and in accordance with the Forest Service's soil and water conservation practices." (FLRMP, pg.IV-43) Note: The "Idaho Water Quality Standards and Wastewater Treatment Requirements" reference the Idaho Forest Practices Act for applicable BMP's.

b. "Treat disturbed areas resulting from management activities in the shortest possible time to meet water quality objectives." (FLRMP pg.IV-46). This BMP relates to the Timber Sale Clause B6.6 on Seasonal Erosion Control Work. This states that erosion control work on sale areas needs to be kept current.

c. "Uphill cable yarding is preferred. Where downhill yarding is used, reasonable care shall be taken to lift the leading end of the log to minimize downhill movement of slash and soils." (IFPA, Rule 3,c,iv.).

d. "To prevent landslides, fill material used in landing construction shall be free of loose stumps and excessive accumulations of slash. On slopes where sidecasting is necessary, landings shall be stabilized by use of seeding, compaction, riprapping, benching, mulching or other suitable means." (IFPA Rule 3, d,iii.)

e. "For each landing, skid trail or fire trail a drainage system shall be provided and maintained that will control the dispersal of surface water in order to prevent sediment from damaging Class I streams." (IFPA, Rule 3, e.) See item 4. below for a definition of a Class I stream.

2. TRACTOR SKIDDING (a-c, FLRMP pg.IV-34)

a. "Tractor skidding will be limited to the following percent slopes to minimize soil erosion.
Quartzite Landtypes--60% Slopes
Volcanic, granitic and sedimentary landtypes--45% Slopes, unless site specific analysis shows otherwise."

b. "Recommended spacing distances for water bars on tractor skid trails will be:

TABLE B.1: SKID TRAIL WATER BAR SPACING (IN FEET)

Gradient (%)	Sediments & Quartzite	Volcanics	Granitics
0-10	200	80	75
10-20	160	70	65
20-30	110	55	50
30-40	80	40	35
40-50	60	35	20
50-60	45	-	-

c. "Ephemeral draws should have minimal disturbance from timber harvest equipment. Crossings and skid trails should be at right angles to draws."

d. "Stabilize skid trails and fire trails whenever they are subject to erosion, by water barring, cross draining, outsloping, scarifying, seeding or other suitable means. This work shall be kept current to prevent erosion prior to fall and spring runoff." (IFPA, Rule 3,e,i.).

3. TIMBER HARVEST IN RIPARIAN AREAS

a. "Regularly scheduled timber harvest is not planned in riparian areas but limited harvest may be appropriate." (FLRMP pg.IV-35). Seek specialist input to design harvest in riparian area to be compatible with other BMP's.

b. "Full suspension yarding will be required to convey logs across all perennial streams, except where skidding would not seriously and adversely affect water condition or fish habitat." (FLRMP pg.IV-42). Input from a Hydrologist and/or Fishery Biologist should be obtained to determine if skidding would adversely affect water condition or fish habitat.

c. "Use directional felling away from perennial and intermittent stream channels, except in cases where serious and adverse influences are not anticipated." (FLRMP pg. IV-42).

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d. "When slash disposal is within riparian zones, it will be hand or grapple piled in areas above the high water mark." (FLRMP pg.IV-42).

e. "Broadcast burning and mechanical site preparation will not be done within perennial riparian zones." (FLRMP pg.IV-42).

f. "Riparian zones will be managed in a manner compatible with the protection of water quality and fish habitat." (FLRMP pg.IV-46). The interpretation of this BMP is that timber harvest in the riparian zone can only be conducted if water quality and fish habitat can be adequately protected.

g. "Whenever possible trees shall be felled, bucked, and limbed in such a manner that the tree or any part thereof will fall away from any Class I streams. Continuously remove slash and other debris that enters Class I Streams as a result of harvesting operations. Place removed material five feet slope distance above the ordinary high water mark." (IFPA, Rule 3,f,i.).

h. "Remove slash and other debris that enters Class II streams whenever there is a potential for stream blockage or if the stream has the ability for transporting the debris immediately following skidding and place removed material above the ordinary high water mark or other wise treat as prescribed by the department." (IFPA, Rule 3,f,ii.). See part 4. below for a definition of a Class II stream.

i. "Tracked or wheel skidding in or through streams shall not be permitted. When streams must be crossed, adequate temporary structures to carry stream flow shall be installed. Cross the stream at right angles to its channel if at all possible. Remove all temporary crossings immediately after use and, where applicable, water bar the ends of the skid trails." (IFPA, Rule 3,g,i.).

j. "Provide the large organic debris (LOD), shading, soil stabilization, wildlife cover and water filtering effects of vegetation along Class I streams."

(1) "Leave hardwood trees, shrubs, grasses, and rocks wherever they afford shade over a stream or maintain the integrity of the soil near a stream."

(2) "Leave 75 percent of the current shade over the stream."

(3) "Carefully log the mature timber from the Stream Protection Zone in such a way that shading and filtering effects are not destroyed."

(4) "Standing trees, including conifers, hardwoods and snags will be left within 50 feet of the ordinary high water mark on each side of all Class I streams in the following minimum numbers per 1000 feet of stream:"

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TABLE B.2: MINIMUM STANDING TREES PER 1000 FEET REQUIRED (ON EACH SIDE)

	Stream Width		
Tree Diameter (DBH) in inches	Over 20 feet	10 to 20 feet	Under 10 feet
0 to 7.9	200	200	200
8 to 11.9	42	42	42
12 to 19.9	21	21	--
20 plus	4	--	--

(5) "Snags will be counted as standing trees in each diameter class if snag height exceeds 1.5 times the distance between the snag and the stream's ordinary high water mark. Not more than 50 percent of any class may consist of snags."

(6) "As an alternative to the standing tree and shade requirements, the operator may notify the department that a site specific riparian management prescription is requested. The department and operator may jointly develop a plan upon consideration of stream characteristics and the need for large organic debris, stream shading and wildlife cover which will meet the objective of these rules."

(7) "Where the opposite side of the stream does not currently meet the minimum standing tree requirements of the table, the department and the operator should consider a site specific riparian prescription that meets the large organic debris needs of the stream."

(8) "Stream width shall be measured as average between ordinary high water marks." (IFPA, Rule 3,g.iii.).

4. STREAM PROTECTION ZONE/FILTER STRIP REQUIREMENTS

The need to maintain an area of undisturbed ground adjacent to streams to serve as a sediment filter is addressed in both the IFPA and the FLRMP. The standard in the IFPA is a set distance for a particular type of stream whereas the filter strip widths recommendations in the FLRMP vary with parent material, percent slope, and percent ground cover. Following are these recommendations:

IFPA STREAM PROTECTION ZONE

"Class I Stream Protection Zone means the area encompassed by a slope distance of 75 feet on each side of the ordinary highwater marks. Class I
streams are used for domestic water supply or are important for the spawning, rearing, or migration of fish. Such waters shall be considered to be Class I upstream from the point of domestic diversion for a minimum of 1,320 feet".

"Class II Stream Protection Zone is the area encompassed by a slope distance of at least 5 feet above the ordinary high water mark on each side of the stream. Class II streams are usually headwater streams or minor drainages that are used by only a few, if any, fish for spawning or rearing. Their principle value lies in their influence on water quality or quantity downstream in Class I streams".

Following is a list from the IFPA of practices prohibited or restricted in the Class I or II Stream Protection Zones (SPZ):

a. "On slopes exceeding 45% gradient and which are immediately adjacent to a Class I or II stream, tractor or wheel skidding shall not be conducted unless the operation can be done without causing accelerated erosion." (pg.7, Rule 3,c,i.).

b. "Construct new landings, skid trails, and fire trails on stable areas outside the appropriate stream protection zone". (pg.8, Rule 3,d,i.)

c. "When cable yarding is necessary across or inside the SP Zones, it shall be done in such a manner as to minimize stream bank vegetation and channel disturbance". (IFPA, Rule 3,g,ii.).

FLRMP FILTER STRIP GUIDELINES

Following are the filter strip guidelines to be used to provide a sediment filter strip immediately adjacent to streams to reduce sediment delivery from roads or other major surface disturbance.

TABLE B.3: FILTER STRIP WIDTHS (IN FEET) IN QUARTZITE PARENT MATERIAL*

Percent Slope

Percent Ground Cover**	0	10	20	30	40	50	60	70	80	90
100	20	25	30	35	45	60	80	110	165	205
90	25	40	55	60	70	85	105	135	190	230
80	30	55	60	65	75	90	110	140	195	235
70	35	60	65	70	80	95	115	145	200	240
60	40	65	70	75	85	100	120	150	205	245
50	45	70	75	80	90	105	125	155	210	250
40	55	80	85	90	100	115	135	165	220	260
30	70	95	100	105	115	130	150	180	235	275
20	100	125	130	135	145	160	180	210	265	305

* From lower edge of disturbed area, road, or toe of fill slope to stream.
** Ground cover estimate includes live plants and letter that can effectively dissipate the energy of raindrops before they hit the soil. Surface rock is not included in this estimate.

TABLE B.4: FILTER STRIP WIDTHS (IN FEET) IN GRANITIC, VOLCANIC AND SEDIMENTARY PARENT MATERIAL*

Percent Slope

Percent Ground Cover**	0	10	20	30	40	50	60	70	80	90
100	30	45	50	55	75	90	110	150	205	245
90	45	60	75	90	100	125	145	175	230	270
80	50	75	90	95	105	130	150	180	235	275
70	55	90	95	100	120	135	155	185	240	280
60	70	95	100	115	125	140	160	190	245	285
50	75	100	115	120	130	145	165	195	250	290
40	85	120	125	130	140	155	175	205	260	300
30	110	135	140	145	155	170	190	220	275	315
20	140	165	170	175	185	200	220	250	305	345

* From lower edge of disturbed area, road, or toe of fill slope to stream.
** Ground cover estimate includes live plants and letter that can effectively dissipate the energy of raindrops before they hit the soil. Surface rock is not included in this estimate.

To ensure compliance with both the FLRMP and the IFPA a minimum SPZ of 75 feet should be used for all perennial streams. The State of Idaho has interpreted the definition of a Class I stream to be virtually all perennial streams. Where the Forest Plan recommends a filter strip width greater than 75 feet, than this distance should be used. Class II streams have been interpreted by the State as any stream having discernible bed and banks, whether or not they are flowing water at the time of logging. Essentially all intermittent and some ephemeral streams would come under this definition. Recommendations on the appropriate width of the filter strip or SPZ will be determined at the project level.

5. ROAD CONSTRUCTION

a. "Timber harvest, road construction, mining, range revegetation and similar activities which have a significant soil disturbing impact will not be permitted on lands identified in the soil resource inventories as exhibiting high mass stability hazard. These activities will be permitted on lands identified in soil resource inventories exhibiting moderate mass stability hazard only if it can be shown that a design can satisfactorily mitigate or prevent potential soil movement." (FLRMP, Pg.IV-43).

b. "Avoid channelization of natural streams. Where channelization is necessary for flood control or other purposes, use stream geometry relationships to re-establish meanders, width/depth ratios, ets., consistent with each major stream type." (FLRMP, pg.IV-46).

c. "Create artificial sediment traps with barriers where the natural vegetation is inadequate to protect any waterway or lake from significant accelerated sedimentation." (FLRMP, pg.IV-64).

d. "Minimize detrimental disturbance to the riparian area by construction activities. Initiate timely and effective rehabilitation of disturbed areas and restore riparian areas so that a vegetative ground cover or suitable substitute protects the soil from erosion and prevents increased sediment yield." (FLRMP, pg.IV-64).

e. "Roads and/or road sections will be surfaced when serious and adverse effects from erosion and sedimentation are anticipated." (FLRMP, pg.IV-64).

f. "Excavated material from road building should be end hauled if there is any potential of a significant amount of sidecast material entering a stream." (FLRMP, pg.IV-64).

g. "Stream crossing structures will be designed and constructed in a manner avoiding serious and adverse affects on fish habitat and passage." (FLRMP,pg.IV-64).

h. "Bridge and culvert projects which are expected to result in detrimental stream channel modifications (i.e., gradient, width, and bank or bed stability) beyond the immediate project area will not be permitted." (FLRMP, pg.IV-64).

i. "Plan each road to the minimum use standards adapted to the terrain and soil materials to minimize disturbances and damage to forest productivity, water quality, and wildlife." (IFPA, Rule 4,b.).

j. "Plan transportation networks to minimize road construction within stream protection zones. Design to leave or reestablish areas of vegetation between roads and streams." (IFPA, Rule 4,b,i.).

k. "Plan minimum cuts and fills particularly near stream channels." (IFPA, Rule 4,b,ii.).

l. "Plan roads to drain naturally by outsloping or insloping with cross-drainage and by grade changes where possible. Plan dips, water bars, and/or cross-drainage on roads when necessary." (IFPA, Rule 4,b,iv.).

m. "Relief culverts and roadside ditches shall be planned whenever reliance upon natural drainage would not protect the running surface, excavation or embankment. Design culvert installations to prevent erosion of the fill. Plan drainage structurus to achieve minimum direct discharge of sediment to streams." (IFPA, Rule 4,b,v.).

n. "Construct cross drains and relief culverts to minimize erosion of embankments. Minimize the time between construction and installation of erosion control devices.

Use riprap, vegetative matter, downspouts and similar devices to minimize erosion of the fill. Install drainage structures, or cross drain uncompleted roads which are subject to erosion prior to fall or spring runoff. Install relief culverts with a minimum grade of 1 percent." (IFPA, Rule 4,c,ix.).

o. "Where exposed material (excavation, embankment, borrow pits, waste piles,etc.) is potentially erodible, and sediments would enter streams, stabilize prior to fall or spring runoff by seeding, compacting, riprapping, benching, mulching or other suitable means." (IFPA, Rule 4,c,iii.).

p. "Construct stream crossings in compliance with minimum standards for stream channel alterations under the provisions of title 42, chapter 38, Idaho Code." (IFPA, Rule 3,c,vi.).

6. ROAD MAINTENANCE

a. "Conduct regular preventive maintenance operations to avoid deterioration of the roadway surface and minimize disturbance and damage to forest productivity, water quality, and fish and wildlife habitat.

(1) Sidecast all debris and slide material associated with road maintenance in a manner to prevent their entry into streams.

(2) Repair and stabilize slumps, slides, and other erosion features causing stream sedimentation." (IFPA, Rule 4,d,i & ii.).

b. "During and upon completion of seasonal operations, the road surface shall be crowned, outsloped, insloped or water barred, and berms removed from the outside edge except those intentionally constructed for protection of fills." (IFPA, Rule 4,d,iii,b.).

c. "If road oil or other surface stabilizing materials are used, apply them in such a manner as to prevent their entry into streams." (IFPA, Rule 4,d, iii,d.).

d. "Inactive roads. An inactive road is a forest road no longer used for commercial hauling but maintained for access (e.g., for fire control, forest management activities, recreational use etc..). Following termination of active use, ditches and culverts shall be cleared and the road surface shall be crowned, outsloped or insloped, water barred or otherwise left in a condition to minimize erosion. Drainage structures will be maintained thereafter as needed." (IFPA, Rule 4,d,iv,).

e. "Abandoned Roads. An abandoned road is not intended to be used again. No subsequent maintenance of an abandoned road is required after the following procedures are completed:

(1) The road is left in a condition suitable to control erosion by outsloping,water barring, seeding, or other suitable methods.

(2) The ditches are cleaned.

(3) The road is blocked to vehicular traffic." (IFPA, Rule 4,d,v.).

APPENDIX B2
FEDERAL CONSISTENCY CHECKLIST

1. Have you identified which nonpoint source activities regulated by the Idaho Water Quality Standards are within the the project area?

ANSWER: Nonpoint source activities within the project area include road construction, timber harvesting, site preparation, reforestation, thinning, and prescribed burning.

2. Have you identified the state approved BMP's for each nonpoint source activity?

ANSWER: Following are the State of Idaho approved BMP's for the proposed activities.
1. Rules and Regulations pertaining to the Idaho Forest Practices Act.
2. Rules and Regulations pertaining to the Idaho Stream Channel Protection Act.
3. Best Management Practices for Road Activities, August,1982. (the Forest Service agreed to implement these in the Nonpoint Source MOU).
In addition, site-specific BMP's or mitigation measures are identified in Chapter 2.

3. For nonpoint source activities which do not have approved BMP's, have you identified practices that demonstate a knowledgeable and reasonable effort to minimize resulting water quality impacts?

ANSWER: All of the proposed nonpoint source activities have approved BMP's.

4. Have you provided a monitoring plan which, when implemented will provide adequate information to determine the effectiveness of the approved or specialized BMP's in protecting the beneficial uses of water?

ANSWER: Yes. See Chapter 2, Water Quality and Fisheries Project Monitoring. In addition the timber sale administrator will be conducting BMP implementation monitoring to ensure that the BMP's and mitigation measures specified in the FEIS have been implemented on the project. During road construction the Engineering Representative will conduct BMP implementation monitoring to ensure that the BMP's specified for the road construction have been implemented on the project.

5. Have you provided a process (including feedback from water quality monitoring) for modifying the approved or specialized BMP's in order to protect

beneficial uses of water?

ANSWER: Yes, the Salmon National Forest Hydrologist and Soil Scientist conduct annual BMP audits on the Forest. During these audits the implemented BMP's are evaluated for their effectiveness. Recommendations to modify or change the BMP's or implement additional ones are then made to the responsible line officer if necessary. Future hydrologic input to projects with nonpoint source activities is enhanced as a result of the BMP audits conducted on the Forest.

6. Have you listed the "appropriate beneficial and existing uses" of water for the waterbodies in the project area?

ANSWER: Yes. See Chapter 3, Hydrology, Existing Condition.

7. Have you determined if a Stream Segment of Concern (SSOC) has been designated within the project area?

ANSWER: There are no Stream Segments of Concern within the analysis area.

8. Have you determined if an Outstanding Resource Water has been designated within the project area?

ANSWER: There are none.

9. Have you identified the Water Quality Standards and criteria applicable to protect the appropriate beneficial uses?

ANSWER: The water quality standards specified in Water Quality Standards and Wastewater Treatment Requirements (IDAPA 16.01.2000) will be followed.

10. Does pre-project planning and design include an analysis of water quality resulting from implementation of the proposed activity sufficient to predict exceedance of water quality criteria for the appropriate beneficial use(s) or in the absence of such criteria, sufficient to predict the potential for beneficial use impairment?

ANSWER: Yes. BOISED model runs and in-stream inventories were used to analyze water quality. A soil scientist and hydrologist were involved in pre-project planning and design to assure that standards would be met.

APPENDIX C

EVALUATION OF WILDLIFE MITIGATION MEASURE

United States Department of Agriculture | Forest Service | Salmon NF

Reply To: 2430/2620 Date: February 9, 1992

Subject: Moyer Salt EIS Wildlife Mitigation Measure

To: District Ranger, Cobalt RD

The following table was prepared to help evaluate the road slash mitigation measure that applies to all action alternatives except number five (Helicopter) in the Moyer Salt EIS.

ALTERNATIVES	1	2 & 2A	3	4	5	6
Without Slash						
Road Density	0	1.46	2.25	1.0	0	1.0
C:F	32:68	27:73	27:73	26:74	29:71	27:73
EHE	68%	34%	34%	27%	55%	34%
With Slash						
Road Density	0	0	0	0	0	0
C:F	32:68	27:73	27:73	26:74	29:71	27:73
EHE	68%	40%	40%	32%	55%	40%
Change in EHE	NA	+15%	+15%	+16%	NA	+15%

For comparison purposes, these calculations were based upon a 2400 acre portion of the total analysis area. This area was centered around Units 21 through 30 and S1-S10 and included portions of Wildlife Analysis Area I and II. Roads that received slash to prevent human access were assumed to be "removed" from the road base (i.e., the area was treated as if it were unroaded).

C. RICHARD WENGER
Forest Wildlife Biologist

CRWenger:crw:sh

Caring for the Land and Serving People

FS-6200-28b(3/92)

APPENDIX D

WILDLIFE SPECIES LIST

APPENDIX D
VERTEBRATE SPECIES LIST

WILDLIFE SPECIES THAT OCCUR IN OR WHOSE HABITAT OCCURS IN THE MOYER SALT ANALYSIS AREA

MAMMALS

Residents
Masked Shrew
Merriam Shrew
Vagrant Shrew
Little Brown Myotis
Long-eared Myotis
California Myotis
Yuma Myotis
Long-legged Myotis
Western Pipistrel
Big Brown Bat
Small-footed Myotis
Western Big-eared Bat
Spotted Bat
Red Squirrel
Northern Flying Squirrel
Northern Pocket Gopher
Ord Kangaroo Rat
Deer Mouse
Bushy-tailed Wood Rat
Wolverine
Striped Skunk
Grey Wolf
Longtail Vole
Sagebrush Vole
Western Jumping Mouse
Pika
Snowshoe Hare
Black Bear
Pine Marten *
Longttail Weasel
River Otter
Mountain Lion
Lynx
Bobcat
Yellowbelly Marmot
Columbian Ground Squirrel
Golden-mantled Squirrel
Least Chipmunk
Yellow Pine Chipmunk
Mountain Cottontail
Pygmy Rabbit
Elk *
Mule Deer *
Mountain Phenacomys
Boreal Redback Vole
Montane Vole
Great Basin Pocket Mouse
Beaver
Northern Grasshopper Mouse
Mountain Goat *
Badger
Coyote
Red Fox
Richardson Vole
House Mouse
Porcupine
Whitetail Jackrabbit
Redtail Chipmunk
Raccoon
Shorttail Weasel
Mink

Migrant
Hoary Bat

AMPHIBIANS

Long-toed Salamander
Tailed Frog
Pacific Tree Frog
Tiger Salamander
Western Toad
Spotted Frog

REPTILES

Western Skink
Western Yellow-bellied Racer
Common Garter Snake
Western Rattlesnake
Rubber Boa
Great Basin Gopher Snake
Western Terrestrial Garter Snake

BIRDS

Residents
Great Blue Heron
Sharp-shinned Hawk
Red-tailed Hawk
Marsh Hawk
American Kestrel
Spruce Grouse
Sage Grouse
Common Snipe
Screech Owl
Pygmy Owl
Red-shafted Flicker
Hairy Woodpecker
Northern Three-toed Woodpecker
Grey Jay
Black-billed Magpie
Common Crow
Black-capped Chickadee
Red-breasted Nuthatch
Dipper
Townsend's Solitaire
Starling
Red-winged Blackbird
House Finch
Grey-crowned Rosy Finch
Pine Siskin
Red Crossbill
Song Sparrow
Goshawk *
Cooper's Hawk
Golden Eagle
Prairie Falcon
Blue Grouse
Ruffed Grouse
Mountain Chickadee
Rock Dove
Great Horned Owl
Great Grey Owl *
Pileated Woodpecker
Downy Woodpecker
Horned Lark
Steller's Jay
Common Raven
Clark's Nutcracker
White-breasted Nuthatch
Brown Creeper *
Robin
Golden-crowned Kinglet
House Sparrow
Evening Grosbeak
Pine Grosbeak
Black Rosy Finch
American Goldfinch
Dark-eyed Junco

Summer Residents
Mourning Dove
Short-eared Owl
Common Nighthawk
Black-chinned Hummingbird
Rufous Hummingbird
Lewis' Woodpecker
Williamson's Sapsucker
Western Kingbird
Hammond's Flycatcher
Western Flycatcher
Olive-sided Flycatcher
Tree Swallow
Flammulated Owl
Saw-whet Owl
White-throated Swift
Broad-tailed Hummingbird
Calliope Hummingbird
Yellow-bellied Sapsucker *
Eastern Kingbird
Alder Flycatcher
Ducky Flycatcher
Western Wood PeeWee
Violet-green Swallow
House Wren

Summer Residents, continued
Winter Wren
Sage Thrasher
Hermit Thrush
Veery
Mountain Bluebird *
Water Pipit
Solitary Vireo
Orange-crowned Warbler
Yellow Warbler *
MacGillivray's Warbler
Wilson's Warbler
Northern Oriole
Brown-headed Cowbird
Black-headed Grosbeak
Purple Finch
Green-tailed Towhee
Savannah Sparrow
Sage Sparrow
Brewer's Sparrow
Fox Sparrow

Grey Catbird
Varied Thrush
Swainson's Thrush
Western Bluebird
Ruby-crowned Kinglet *
Cedar Waxwing
Red-eyed Vireo
Nashville Warbler
Yellow-rumped Warbler
Yellowthroat
Western Meadowlark
Brewer's Blackbird
Western Tanager
Lazuli Bunting
Cassin's Finch
Rufous-sided Towhee
Vesper Sparrow *
Chipping Sparrow
White-crowned Sparrow
Lincoln's Sparrow

Migrants
Ferruginous Hawk
Long-eared Owl
Black and White Warbler
Townsend's Warbler
Lark Sparrow

Band-tailed Pigeon
Say's Phoebe
Black-throated Grey Warbler
Northern Waterthrush
Harris' Sparrow

Winter Visitors
Rough-legged Hawk
Bald Eagle
Northern Shrike
Common Redpoll
Tree Sparrow

Merlin
Bohemian Waxwing
Loggerhead Shrike
White-winged Crossbill
Snow Bunting

FISH

Anadromous Species
Steelhead Trout

Chinook Salmon

Resident Species
Rainbow (red band) Trout
Mountain Whitefish

Bull Trout
Sculpin

* Salmon National Forest Management Indicator Species

APPENDIX E

VEGETATION SPECIES LIST

APPENDIX E

VEGETATION SPECIES LIST FOR THE MOYER-SALT TIMBER SALE ANALYSIS AREA
DOUGLAS-FIR/PINEGRASS HABITAT TYPE (PSME/CARU)
TREES Subalpine fir (*Abies lasiocarpa*) Engelmann spruce (*Picea engelmannii*) Whitebark pine (*Pinus albicaulis*) Lodgepole pine (*Pinus contorta*) Quaking aspen (*Populus tremuloides*) Douglas-fir (*Pseudotsuga mensiesii*)
SHRUBS and SUBSHRUBS Mountain maple (*Acer glabrum*) Western serviceberry (*Amelanchier alnifolia* Bearberry or kinnikinnick (*Arctstaphylos uva-ursi* Big sagebrush (*Artemisia tridentata*) Oregon grape (*Berberis repens*) Showbrush ceanothus (*Ceanothus velutinus*) Common juniper (*Juniperus communis*) Utah honeysuckle (*Lonicera utahensis*) Ninebark (*Physocarpus malvaceus*) Bitterbrush (*Purshia tridentata*) Squaw currant (*Ribes cereum*) Prickly currant (*Ribes lacustre*) Sticky currant (*Ribes viscosissimum*) Wood's rose/wild rose/ pearhip rose (*Rosa woodsii*) Scouler's willow (*Salix scouleriana*) Buffalo berry (*Shepherdia canadensis*) White spirea (*Spiraea betulifolia* Mountain snowberry (*Symphoricarpos oreophilus*) Grouse whortleberry (*Vaccinium scoparium*)
GRAMINOIDS Bluebunch wheatgrass (*Agropyron spicatum*) Pinegrass (*Calamagrostis rubescens*) Northwestern sedge (*Carex concinnoides*) Elk sedge (*Carex geyeri*) Ross's sedge (*Carex rossii*) Idaho fescue (*Festuca idahoensis*) Wheeler bluegrass (*Poa nervosa*) Western needlegrass (*Stipa occidentalis*)

VEGETATION SPECIES LIST FOR THE MOYER-SALT TIMBER SALE ANALYSIS AREA
FORBS Common yarrow (*Achillaea millefollium*) Rose pussytoes (*Antennaria microphylla*) Pussytoes (*Antennaria racemosa*) Arenaria or sandwort (*Arenaria macrophylla*) Heartleaf arnica (*Arnica cordifolia*) Showy aster (*Aster conspicuus*) Arrowleaf balsamroot (*Balsamorphiza sagittata*) Common Indian paintbrush (*Castilleja miniata*) Hawksbeard (*Crepis accuminata*) Fireweed (*Epilobium angustifolium*) Wild strawberry (*Fragaria vesca*) Wild strawberry (*Fragaria virginia*) Sticky geranium (*Geranium viscosissimum*) Mountain avens (*Geum triflorum*) Rattlesnake plantain (*Goodyera oblongifolia*) Hawkweed (*Hieracium albiflorum*) Silver lupine (*Lupinus argenteus*) Mountain sweet-root (*Osmorhiza chilensis*) Blunt-fruited sweet-root (*Ormorhiza depauperata*) Wilcox's penstemon (*Penstemon wilcoxii*) Silverleaf phacelia (*Phacelia hastata*) Slender cinquefoil (*Potentilla gracilis*) Side-bells pyrola or wintergreen (*Pyrola secunda*) Groundsel (*Senecio streptanthifolius*) False Solomon's seal (*Smilacina racemosa*) Alpine goldenrod (*Solidago multiradiata*) Western meadowrue (*Thalictrum occidentalis*) Blue violet (*Viola adunca*) Yellow violet (*Viola nuttallii*) Goosefoot violet (*Viola purpurea*) Beargrass (*Xerophyllum tenax*)

VEGETATION SPECIES LIST FOR THE MOYER-SALT TIMBER SALE ANALYSIS AREA

SUBALPINE FIR HABITAT TYPES (ABLA/CARU, ABLA/VASC, ABLA/ALSI)

TREES
Subalpine fir (*Abies lasiocarpa*)
Engelmann spruce (*Picea engelmannii*)
Whitebark pine (*Pinus albicaulis*)
Lodgepole pine (*Pinus contorta*)
Quaking aspen (*Populus tremuloides*)
Douglas-fir (*Pseudotsuga menziesii*)

SHRUBS and SUBSHRUBS
Mountain alder (*Alnus sinuata*)
Western serviceberry (*Amelanchier alnifolia*)
Big sagebrush (*Artemisia tridentata*)
Oregon grape (*Berberis repens*)
Snowbrush ceanothus (*Ceanothus velutinus*)
Common juniper (*Juniperus communis*)
Labrador tea (*Ledum glandulosum*)
Utah honeysuckle (*Lonicera utahensis*)
Squaw currant (*Ribes cereum*)
Mountain gooseberry (*Ribes montigenum*)
Sticky currant (*Ribes viscosissimum*)
Scouler's willow (*Salix scouleriana*)
Mountain-ash (*Sorus scopulina*)
White spirea (*Spiraea betulifolia*)
Mountain snowberry (*Symphoricarpos oerophilus*)
Dwarf huckleberry (*Vaccinium caespitosum*)
Blue huckleberry (*Vaccinium globulare*)
Grouse whortleberry (*Vaccinium scoparium*)

GRAMINOIDS
Common brome (*Bromus vulgaris*)
Bluejoint (*Calamagrostis canadensis*)
Pinegrass (*Calamagrostis rubescens*)
Northwestern sedge (*Carex concinnoides*)
Elk sedge (*Carex geyeri*)
Ross's sedge (*Carex rossii*)
Blue wild-rye (*Elymus glaucus*)
Idaho fescue (*Festuca idahoensis*)
Junegrass (*Koeleria cristata*)
Oniongrass (*Melica bulbosa*)
Wheeler bluegrass (*Poa nervosa*)
Western needlegrass (*Stipa occidentalis*)

VEGETATION SPECIES LIST FOR THE MOYER-SALT TIMBER SALE ANALYSIS AREA

FORBS
Common yarrow (*Achillaea millifollium*)
Rose pussytoes (*Antennaria microphylla*)
Pussytoes (*Antennaria racemosa*)
Arenaria or sandwort (*Arenaria aculeata*)
Arenaria or sandwort (*Arenaria macrophylla*)
Heartleaf arnica (*Arnica cordifolia*)
Mountain arnica (*Arnica latifolia*)
Arrowleaf balsamroot (*Balsamorhiza sagittata*)
Common Indian paintbrush (*Castilleja miniata*)
Prince's pine (*Chimaphila umbellata*)
Fireweed (*Epilobium angustifolium*)
Wild strawberry (*Fragaria virginiana*)
Richardson's geranium (*Geranium richardsonii*)
Sticky geranium (*Geranium viscosissimum*)
Hawkweed (*Hieracium albiflorum*)
Hawkweed (*Hieracium gracile*)
Silver lupine (*Lupinus argenteus*)
Mountain sweet-root (*Ormorhiza chilensis*)
Sickletop lousewort or parrot's beak (*Pedicularis racemosa*)
Cinquefoil (*Potentilla diversifolia*)
Side-bells pyrola or wintergreen (*Pyrola secunda*)
Groundsel (*Senecio streptanthifolius*)
False Solomon's seal (*Smilacina racemosa*)
Alpine goldenrod (*Solidago multiradiata*)
Western meadowrue (*Thalictrum occidentalis*)
Sitka valerian (*Valeriana sitchensis*)
False hellebore (*Veratrum viride*)
Blue violet (*Viola adunca*)
Round-leaved violet (*Viola orbiculata*)
Goosefoot violet (*Viola purpurea*)

APPENDIX F

BIOLOGICAL ASSESSMENT FOR FEDERALLY LISTED:

PLANT AND TERRESTRIAL VERTEBRATE SPECIES

FISH SPECIES

BIOLOGICAL ASSESSMENT FOR FEDERALLY LISTED SPECIES OF PLANTS AND TERRESTRIAL VERTEBRATES

Prepared by: C.R. Wenger, Forest Wildlife Biologist

March 31, 1993

BIOLOGICAL ASSESSMENT

for

THE PROPOSED

MOYER-SALT ENVIRONMENTAL IMPACT STATEMENT

Salmon National Forest
Salmon, Idaho

March 31, 1993

Prepared by:

C. RICHARD WENGER
Forest Biologist

I. INTRODUCTION

As part of the Forest Plan (FLRMP) implementation process, the Cobalt Ranger District of the Salmon National Forest is proposing to harvest the Moyer-Salt Timber Sale in the Moyer Creek and Woodtick Creek drainages, major tributaries of Panther Creek (Figure 1-2). This proposed project area is located approximately 8.5 miles south of the old townsite of Cobalt, Idaho. Included within this area is a large portion of the Taylor Mountain Inventoried Roadless Area (No. 13902).

The most prevalent forested habitat types are Douglas fir/pinegrass and Douglas-fir/Idaho fescue on the lower elevations and subalpine fir/grouse whortleberry on the higher elevations. The latter is represented by various seral stands ranging from pure lodgepole pine to subalpine fir. The entire analysis area provides good to excellent summer habitat for elk and mule deer and the lower elevations, dominated by sagebrush/bunchgrass communities offer good winter range, especially for elk. Forested riparian areas are most commonly occupied by Engelmann spruce/red osier dogwood and nonforested ones are in the willow/sedge series.

This Biological Assessment conforms with the legal requirements set forth under Section 7 of the Endangered Species Act (19 U.S.C. 1536(c), 50 CFR 204.12(f) and 402.14(c) and FSM 2672.42).

II. CONSULTATION TO DATE

A Species List for this project was provided by the US Fish and Wildlife Service on January 29, 1991, (List #1-4-91-SP-204). There were no listed species on this list. This list was updated via telephone on March 31, 1993, and the gray wolf which is currently classified as endangered was added.

III. CURRENT MANAGEMENT DIRECTION

The project area for this proposal is primarily within 3A-4A (anadromous fish - key big game winter range), 3A-5B (anadromous fish-medium timber investment), and 3A-5A (anadromous fish-high timber investment) management prescription areas as delineated in the current FLRMP. Wildlife and fish management goals and objectives for this area are thus focused on anadromous fish species habitat needs and on providing wildlife habitat quality and quantity commensurate with Idaho Department of Fish and Game species management goals, particularly for big game, while providing timber outputs.

No specific habitat management plans or species management guidelines currently exist for gray wolves in this area. However, this area is within the Central Idaho Wolf Recovery Area as roughly delineated in the Northern Rocky Mountain Wolf Recovery Plan (USFWS 1987).

IV. DESCRIPTION OF PROJECT PROPOSAL

The Forest Service proposes to harvest timber, construct and reconstruct roads, and regenerate new stands of trees in portions of the Moyer Creek, Salt Creek, Woodtick Creek, and Goodluck Creek drainages, and Pete's Gulch in the Cobalt Ranger District of the Salmon National Forest (Figure 1-2, Location Map). The proposed Moyer Salt Timber Sale (formerly the Moyer Salt and Salt Creek timber sales) was originally disclosed in the Notice of Intent in the July 6, 1990, Federal Register. The proposed timber harvesting and road construction activities would harvest about 747 acres in a maximum of 30 units and construct about 17.8 miles of road. Trees harvested

from these units would yield approximately 6.0 million board feet (mmbf) of timber. This sale would be offered in 1993. The timing of timber harvesting and road building would be staggered between two subdivisions to provide wildlife displacement opportunities.

V. EFFECTS OF PROPOSED ACTION

The gray wolf, an endangered species since 1973, commonly occurred on the Salmon National Forest up until the 1940's. Since that time, no verified sightings have been documented (i.e. hair samples, photographs, or dead animals). However, observations/reports have been received from the Salmon area since 1968. Many of these observations are unverified wolf sightings along the Continental Divide. Among these sightings are three highly probable reports which were made near Leadore about a decade ago. In 1980 and 1981, tracks of large canids were found in Cruikshank Creek by a US Forest Service biologist and both observations are considered highly probable. One other probable sighting of three animals was made in Hawley Creek in 1982. These sightings occurred approximately 75 miles southeast of the Moyer-Salt analysis area.

Wolves are opportunistic predators that prey on large ungulates as well as small to mid-size mammals. They hunt cooperatively and the complex social interactions of the wolf pack enable them to successfully kill elk, moose and deer. However, most of the sightings made in the Lemhi valley are of single animals suggesting that these wolves may be dispersing individuals who are traveling through the area, perhaps searching for vacant suitable habitat or mates.

Repeated efforts to locate tracks, scats and howling wolves in the past three years has been unsuccessful on the Salmon National Forest. (See Forest and District files of TE&S inventories.) Historic (recent) observations of these canines indicate that wolves may inhabit the Forest periodically but the lack of consistent or verified sightings and responses to howling surveys show that wolves most likely are not residents of this Forest.

Wolf habitat quality is directly linked to low human activity (i.e. low road density and motorized travel restrictions) and large ungulate density. The Moyer-Salt area is easily accessed by improved and primitive roads and motorized travel is essentially unrestricted except for the administratively closed Woodtick Road. Although prey populations, particularly elk, are currently adequate to support pack activity over most of the Cobalt Ranger District, including this specific area which is an important big game summering area, the whole area is so easily accessed and dissected by roads and trails that successful recolonization of most of the District is doubtful. However, this area is considered important to the overall recovery goals for this species.

A. Direct Effects

The road system that will be constructed to access the proposed timber harvest units will be gated and administratively closed to motorized traffic. In addition the portion of road through the mapped key elk summer range will have slash piled on the road surface to effectively prevent human use by foot or horse. Consequently, human access and presence, after completion of sale activities, should not be appreciably different (i.e. more) than current or presale. Therefore, the only time when human presence in the area will be above current levels is during the active portion of the sale. Since the primary cause of direct wolf mortality is human encounters, it follows that the only time the potential for direct mortality will increase is during the active portion of the sale. This increase should be insignificant because wolves are not known to frequent the allotment, displacement of primary prey species (elk and mule deer) will occur during sale activities and

the timber operator and all workers will be made aware of the possible presence of wolves, their identification and endangered status.

B. Indirect Effects

Any reduction in the quality of big game (primary prey) habitat could indirectly affect wolf use or potential use of an area by decreasing prey availability. All proposed action alternatives, with their mitigation measures and management requirements, are compatible with FLRMP wildlife habitat management direction and objectives for management area prescriptions in this analysis area. Consequently, post-sale elk and mule deer habitat will be of sufficient quality to help support target populations for these species as stated in the current Idaho Department of Fish and Game Five-Year Species Management Plans. Therefore no indirect effects on wolves or their habitat are predicted.

VI. DETERMINATION

It is my determination that the actions proposed in the Moyer-Salt Timber Sale may affect but are not likely to adversely affect the Endangered gray wolf, its habitat or its recovery potential for the following reasons:

1. No critical habitat has been identified in this project area.
2. Wolves are not known or suspected to frequent this area.
3. Human encounters, the only potential direct effect on wolves, will be mitigated via informing all persons involved in the timber sale operation of the possible presence of wolves , their identification and endangered status.

VII. SIGNATURE

C Richard Wenger Date 4/2/92

C. RICHARD WENGER
Wildlife Biologist

BIOLOGICAL ASSESSMENT FOR FISHERIES

MOYER SALT TIMBER SALE

Prepared by: Robert Rose, Fishery Biologist, Salmon National Forest

April, 1992

Reviewed by: Bruce Smith, Forest Fishery Biologist

Bruce H. Smith

Approved by: Dan Baird, Branch Chief,
Range, Recreation, Watershed, & Wildlife

Introduction

This Biological Assessment (BA) addresses the potential impacts of the Moyer Salt Timber Sale on listed and proposed Threatened and Endangered aquatic vertebrate (fish) species. The Biological Assessment process is intended to conduct and document activities necessary to ensure proposed management actions will not jeopardize the continued existence or cause adverse modification of habitat for:

A. Species listed or proposed to be listed as Endangered (E) or Threatened (T) by the USDI Fish and Wildlife Service (USFWS).

B. Species listed or proposed to be listed as Endangered (E) or Threatened (T) by the USDC National Marine Fisheries Service.

This BA was prepared by Robert Rose, Fishery Biologist, Salmon National Forest, in accordance with direction provided in Section 7(c) of the Endangered Species Act and in Section 2672.42 of the Forest Service Manual (FSM). The conclusions and recommendations in the BA were drawn from the following data sources: documentation of sightings and suitable habitat during a site-specific T&E field survey within the analysis area of the Moyer Salt Timber Sale; a literature review; and, contact with professionals knowledgeable of species' habitat requirements. Findings and conclusions were reviewed by Bruce Smith, Forest Fishery Biologist, and Dan Baird, Branch Chief; Range, Recreation, Watershed and Wildlife Branch.

Proposed Action

As part of the Forest Plan implementation process, the Cobalt Ranger District of the Salmon National Forest is proposing the Moyer Salt Timber Sale within the Taylor Mountain Roadless Area (No. 13-902) (See Moyer Salt Timber Sale EIS, Figure 1). Under the proposed action and its alternatives, the Forest Service proposes to construct between 15.7 and 17.8 miles of road, and harvest between 3.75 and 6.90 mmbf of timber on 440 to 847 acres within the upper Woodtick Creek watershed and the upper Salt and "Perm" Creek drainages of the Moyer Creek watershed. These proposed actions are designed to help achieve the silvicultural goals and objectives of the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan) (USDA Forest Service, 1988) to help satisfy the short-term demand for timber while providing for community stability and maintenance of a continuous supply of timber for the future.

Threatened and Endangered Species

The National Marine Fisheries Service (NMFS) has recently listed the Snake River Basin sockeye (Oncorhynchus nerka) as an "Endangered" species (Federal Register, November 20, 1991), and the Snake River Basin spring/summer chinook (Oncorhynchus tshawytscha) as a "Threatened" species (Federal Register, April 22, 1992) under provisions of the Federal Endangered Species Act of 1973.

In accordance with Section 7(c) of the Endangered Species Act, the National Marine Fisheries Service (NMFS) was notified of the proposed action (Telephone conference of Oct 8, 1991 and letter of April 6, 1992 to Karen Holtz, National Marine Fisheries Service) and asked to provide the Forest with a determination of the presence or absence of proposed Threatened and/or Endangered anadromous fish species within a designated project analysis area encompassing the Moyer and Woodtick Creek drainages. At this time, the National Marine Fisheries Service has not identified critical recovery habitat for either Snake River sockeye or Snake River spring/summer chinook salmon. This Biological Assessment, therefore, was prepared based upon chinook salmon habitat suitability information

supplied by the Northwest Power Planning Council (NPPC), Salmon National Forest fisheries file information, and general documentation of historic chinook salmon utilization of spawning and rearing habitats within the Panther Creek drainage.

While the Panther Creek drainage system was historically a major producer of spring chinook salmon and summer steelhead (Reiser, 1986), utilization of its mainstem and tributary waters by these fish began a decline in the 1940s, and has been largely precluded since the 1960s by chemical pollution of mid and lower mainstem Panther Creek migration corridors attributable to operations of the Blackbird Mine (Reiser, 1986; Idaho Department of Fish and Game, 1965). Despite these mainstem water quality problems, however, Panther Creek and its historically utilized tributaries, including Moyer Creek, continue to be regarded as potentially viable producers of spring/summer chinook salmon (Northwest Power Planning Council, 1988). The Salmon National Forest Land and Resource Management Plan (FLRMP) calls for continued management directed toward these anadromous stocks in anticipation of correction of mine drainage problems and recovery of mainstem water quality (USDA Forest Service, 1988). Idaho Department of Fish and Game management prescriptions for the two streams calls for a preservation management strategy for anadromous fish stocks, which maintains a harvest closure and may supplement natural recruitment with possible stockings of fry or fingerlings (Idaho Department of Fish and Game, 1991). The Northwest Power Planning Council Salmon River Sub-Basin Plan also includes a recovery program for the Panther Creek drainage (Northwest Power Planning Council, 1990).

Sockeye Salmon utilize the waters of the mainstem Salmon River as a migration corridor to traditional spawning areas within the Sawtooth National Recreation Area, but are not known to spawn in streams or lakes of the Salmon National Forest (Simpson and Wallace, 1982).

Occupied and Unoccupied Critical or Proposed Critical Habitat

The National Marine Fisheries Service has not, at this time, designated any critical or proposed critical habitat for recovery of chinook salmon. Salmon National Forest management direction for Panther Creek and its major tributaries, however, reflects recognition of the importance of the drainage as a major potential producer of both chinook salmon and steelhead, as evidenced by its inclusion within the 3A-5A, 3A-5B, and 3A-5C management areas (USDA Forest Service, 1988). Moyer Creek has been identified as the single most important historic chinook salmon spawning tributary of the Panther Creek drainage system (Reiser, 1986). Northwest Power Planning Council presence/absence files for the Panther Creek sub-basin indicate a potential production of 36,730 chinook salmon smolts annually within the Moyer Creek drainage (Northwest Power Planning Council, 1988). The NPPC files do not indictate any potential for chinook salmon production within the Woodtick Creek drainage, although the habitat capability for potential production of steelhead is acknowledged. Field review of the Woodtick Creek by Forest fisheries personnel indicates that the NPPC assessment of the stream reflects the steeper stream gradient, as well as the questionable access by chinook salmon under summer flow conditions. A minor amount of th

Potential Effects on Species or Habitat

Potential effects of timber harvest activities on fisheries resources are primarily related to impacts on stream substrates, fish migration opportunities, riparian area integrity, and streamflow magnitude and timing. Forest transportation systems which are poorly designed or lacking in effective mitigation measures can have significant effects on fish and their habitats as a result of direct deposition of sediment into stream channels (Yee and Roelofs, 1980). Incremental sediment contribution per unit area as a result of poor road design can potentially exceed that from all other land management activities, including log skidding and yarding (Yee and Roelofs, 1980). Excess sediment production can adversely affect fish habitat by reducing substrate permeability (Wicket, 1958; Mcneil and Ahnell, 1964), impeding or preventing fry emergence (Koski, 1966; Bjornn, 1969), and reducing rearing and

overwintering habitat (Phillips, 1970). Increased sedimentation of stream substrates are also associated with decreased diversity of cover for bottom fauna (Sprules, 1947; Kimble and Wesche, 1975). Massive increases in sediment production may exceed the stream's ability to transport the load that has been introduced (Leopold, 1964).

Improperly designed road culverts associated with stream crossings have the potential to create barriers to fish migration, usually because of excessive outfall heights or water velocities, insufficient water depths, lack of resting pools, or combinations of these factors (Evans and Johnson, 1974; Yee and Roelofs, 1980).

Riparian vegetation serves an important role in stabilizing banks, providing summer stream shading and winter thermal cover, contributing organic matter and terrestrial insects to the stream, and serving as a buffer against sediment transport into stream channels (Meehan et al, 1977; Yee and Roelofs, 1980). Improper timber harvest techniques which result in the removal of riparian vegetation or streamside shade trees have the potential to increase summer water temperatures, decrease winter water temperatures, and adversely affect egg incubation (Greene, 1950; Chapman, 1962). Removal of overhanging vegetative cover can result in increased predation and reduction of preferred juvenile salmonid microhabitats (Chapman, 1966; Allen, 1969), and accelerated formation of anchor ice (Bruce Smith, personal communication).

Timber harvest encompassing more than 15 to 20 percent of a drainage's total basin area has been shown to be capable of producing modifications to peak runoff flow timing and magnitude (Troendle and Leaf, 1982, as cited by Troendle, 1985). Extensive timber harvest activity within a drainage has the potential to increase water yields and peak flows to a point that channel erosion occurs (Rosgen, 1978).

Cumulative Effects

Previous timber management activities within the Moyer-Salt Timber Sale analysis area include the 1988 Tick Creek Timber Sale, which harvested 23.0 percent of the Little Woodtick Creek drainage. This level of of harvest has been shown to produce significant increases in water yield within a drainage (Troendle and Leaf, 1982, as cited by Troendle, 1985), and was believed to be the factor responsible for an apparent increase in peak runoff flow within the Little Woodtick Creek drainage during the 1991 water year (Elizabeth Rieffenberger, personal communication). Within the larger Woodtick Creek drainage, the Tick Creek Sale corresponded to a 5.2 percent harvest of the total drainage basin. The increased magnitude of peak flow observed within the Little Woodtick Creek drainage was not believed to have produced any deleterious impacts to mainstem Woodtick Creek (Elizabeth Rieffenberger, personal communication) due to variation in the timing of peak runoff between the two streams. Additional harvest operations within the Woodtick Creek drainage, if conducted at an intensity comparable to that of the Tick Creek Timber Sale, however, would have the potential to adversely affect the magnitude and timing of runoff flows in mainstem Woodtick Creek.

Determination

Contingent upon implementation of Salmon National Forest soil and water Best Management Practices (BMPs) (Moyer Salt Timber Sale EIS, Appendix A) and proposed site-specific soil, water and fisheries mitigation measures (Moyer Salt Timber Sale Draft EIS, Chapter II, Mitigation Measures, Chapter 2), implementation of the proposed road construction and timber harvest activities is not likely to adversely affect identified T&E fish species within the Moyer Creek or Woodtick Creek drainages. Rationale for this determination follows.

Rationale for Determination

Direct and Indirect Effects

In making a determination of the potential effects of road construction and timber harvest on TES fish species, primary considerations are sedimentation of stream substrates, degradation of riparian area integrity, impairment of migration opportunities, and modification of annual streamflow patterns. Salmon National Forest soil and water Best Management Practices (BMPs) and site-specific soil, water, and fisheries mitigation measures identified in Chapter II of the Moyer-Salt Timber Sale Draft EIS are designed to address and minimize potential sediment, migration, and riparian impacts to fisheries resources associated with road construction and timber harvest activities. Implementation of these measures will ensure that 1) sediment generated as a result of road construction or timber harvest is both minimized and intercepted before entering stream channels, 2) riparian integrity is maintained to ensure adequate shading of stream channels and retention of protective overhead cover from predators, 3) transportation route crossings of streams containing fisheries resources are designed to accommodate species-specific migration needs, and 4) basin harvest intensity is constrained to levels which do not produce significant modification of peak streamflow intensities and/or timing.

Road construction and timber harvest activities proposed for this timber sale will be concentrated to a large extent on mid or upper slopes of the Woodtick, Salt and "Perm" Creek drainages. Only six of 32 proposed cutting units will be located at distances within 200 feet of active stream channels. At these sites, filter strip widths consistent with Forest Plan direction will be employed to intercept sediment before reaching stream channels. Additionally, these buffers will be maintained in an uncut status to retain existing ground cover within riparian areas, ensure adequate shading of active stream channels, maintain streambank stability, and provide for future recruitment of large organic debris.

Under the various proposed alternatives, stream crossings will be required on Woodtick, Goodluck, Perm, and Salt Creek. At all stream crossings where fish are known or suspected to occur, design criteria will ensure yearround fish passage opportunities. Installation activities will be timed to precede the bull trout spawning period, and will be consistent with Forest guidelines (see "Performance Criteria to be Observed to Protect Stream Channels", Appendix C) to ensure minimal water quality and stream substrate impacts below construction sites. Additionally, an existing 60 inch culvert on Woodtick Creek (Section 32 of Township 20 N, Range 19 E) which currently presents a barrier to migration of both resident and anadromous fish is to be repaired or replaced under a variety of funding mechanisms dependent upon the selected action alternative. Correction of this barrier will reopen access to previously unreachable steelhead spawning habitat within the upper reaches of Woodtick Creek. Localized construction-related impacts to stream substrates at this site are expected to be ameliorated within the time frame of natural or enhanced recovery of mainstem Panther Creek water quality.

Under the most timber-intensive proposed harvest alternative, total basin harvest would be limited to 3.0 percent of the Woodtick Creek drainage, 14.3 percent of the Salt Creek drainage, and 14.2 percent of the "Perm" Creek drainage. This level of basin disturbance would be substantially below the 15 to 20 percent regarded as capable of producing significantly increased water yield (Troendle and Leaf, 1980, as cited by Troendle, 1982) in the Woodtick Creek drainage, and would approach but not reach these levels in the previously undisturbed Salt and "Perm" Creek drainages of the Moyer Creek system. Proposed harvest prescriptions under other alternatives identified within the Moyer-Salt Draft EIS would impact substantially less of the Salt and "Perm" Creek drainage basins.

Cumulative Effects

Foreseeable nearterm activities within the analysis area are limited to timber stand improvement operations within shelterwood cutting units, post and pole sales, and public firewood salvage. No

Troendle, C. A. 1982.
The Effects of Small Clearcuts on Water Yield from the Deadhorse Watershed; Fraser, Colorado. p 75-83. In: Proceedings of the 50th Annual Meeting of the Western Snow Conference (Reno, Nev., April 19-23, 1982) 225 p. Colorado State University, Fort Collins, Colo.

USDA Forest Service. 1988.
Forest Land and Resource Management Plan for the Salmon National Forest, and EIS.

APPENDIX G

BIOLOGICAL EVALUATION FOR SENSITIVE SPECIES:

PLANTS AND TERRESTRIAL VERTEBRATES

FISH SPECIES

APPENDIX G1

BIOLOGICAL EVALUATION FOR SENSITIVE SPECIES OF PLANTS AND TERRESTRIAL VERTEBRATES

Prepared for the Moyer Salt Timber Sale
Cobalt Ranger District
Salmon National Forest

Prepared by : C.R. Wenger, Forest Wildlife Biologist

March 9, 1992

I. INTRODUCTION

As part of the Forest Plan implementation process, the Cobalt Ranger District of the Salmon National Forest is proposing to harvest the Moyer Salt and Salt Creek timber sale in the Taylor Mountain Inventoried Roadless Area No. 13902. The analysis area for this sale includes portions of the Moyer Creek and Woodtick Creek drainages, both of which are tributaries to Panther Creek.

In accordance with Section 7(c) of the Endangered Species Act of 1973, as amended, the US Fish and Wildlife Service (FWS) was notified of this proposed action and determined that no listed or proposed threatened or endangered species are known present in the Moyer Salt analysis area. Consequently, these species will not be addressed further.

Region 4, the Intermountain Region of the USDA Forest Service, has compiled a list of 30 vertebrate "sensitive" species. This list contains only species for which population viability is a concern, as evidenced by significant current or predicted downward trends in population or habitat capability. Of these species, only one, the Northern goshawk (*Accipiter gentilis*) has been observed and thus is known to occur in this analysis area. However, based upon habitat preferences, the following species may also occur: North American lynx (*Felis lynx canadensis*), wolverine (*Gulo gulo*), Western big-eared bat (*Plecotus townsendii*), boreal owl (*Aegolius funereus*), Northern three-toed woodpecker (*Picoides tridactylus*), great gray owl (*Strix nebulosa*), and spotted frog (*Rana pretiosa*). In addition, this region has also compiled a Sensitive Plant Species List for each Forest. Of the 12 species currently on the Salmon National Forest's list, only *Penstemon lemhiensis* may possibly occur on this analysis area.

The Conservation Data Center, a branch of the Idaho Department of Fish and Game, has also prepared a list of vertebrate "Species of Special Concern." Examination of this list did not reveal any additional species that may occur in this analysis area.

Because there are no federally listed terrestrial vertebrate threatened or endangered species in the Moyer Salt Timber Sale analysis area, the objective of this Biological Evaluation is to predict the probable effects, positive, negative or neutral, of the Moyer Salt and Salt Creek Timber Sale proposal on the previously listed sensitive species that may occur here. Detailed descriptions of the proposed action and the alternatives are contained in the body of this Environmental Impact Statement (EIS) and will not be repeated here.

II. VERTEBRATE SENSITIVE SPECIES

A. North American Lynx

The lynx, a close relative of the bobcat, is a common wild felid in the boreal forests of Canada, Alaska and the northern Rocky Mountains as far south as southern Colorado and northern New Mexico (Quinn and Parker, 1987). Lynx are extremely well adapted to travel in deep snow (Koehler and Brittell, 1990). This is vital to the pursuit of snowshoe hare, their primary prey species. Lynx predation on large mammals is very uncommon. Mean snow accumulation on winter ranges is apparently the most important factor that creates niche separation between lynx and bobcats.

Because lynx depend very heavily upon snowshoe hare as their principal food source, good hare habitat is also considered good lynx habitat. In the analysis area, snowshoe hare and thus lynx are most commonly found in the spruce/subalpine fir forests where shrubby riparian zones and/or openings occur. These areas provide both good conifer cover and browse for hares. Consequently,

any irregular pattern of logging and/or fire in high elevation forests usually provide prime hare and lynx habitat. Therefore timber harvest activity as proposed in any of the Moyer Salt Timber Sale action alternatives spelld actually have a positive effect on lynx (and snowshoe hare) populations.

B Wolverine

The wolverine is the largest terrestrial member of the mustelid family. Worldwide, this species has a vast circumboreal distribution. In North America wolverines commonly occur throughout Alaska and northwest Canada. Occupied range along the Rocky Mountains south into the counterminous U.S. is currently uncertain but is known to include Montana, Idaho and the northwest corner of Wyoming. They are confined to montane boreal regions where their large feet serve well for travel over deep snow, digging for prey and climbing (Hash 1987). Wolverines usually occupy backcountry or wilderness areas with little or no human habitation. Densities are low in good habitat and are extremely low (i.e. one wolverine in 50 to 75 square miles) in the less suitable habitats such as the southern limits of their range.

Wolverines are best described as scavenging predators. However, they are entirely opportunitistic feeders that utilize prey species such as rodents and marmots in addition to carrion and various fruits, etc., as available. The large home range size, low population density and nonselective feeding nature of this species makes it fairly unsusceptible to site specific disturbances such as timber harvest activities. This is especially true since primary wolverine habitat occurs at elevations above most commercial forest sites on this Forest and in this analysis area. Also, since new roads will be closed after the proposed sales, human presence should not be significantly different from the current situation. For these reason, this proposed action is not expected to affect possible wolverine presence and/or habitat.

C. Northern Three-toed Woodpecker

The northern three-toed woodpecker is relatively common throughout the montane, boreal coniferous forest, particularly in the spruce-fir and limber pine-whitebark pine zones (Larrison, 1981). Alternatives under this proposal are primarily confined to elevations below the preferred habitats of this species. Consequently, no significant impacts upon this species would be predicted.

D. Great Gray Owl

Great gray owls, like boreal owls, are found in the spruce-fir life zones of the boreal montane coniferous forests. However, this species utilizes lodgepole pine habitat types as well as subalpine fir types. In addition, two major differences include the use of open forests and openings for preferred feeding sites and a preference for platform instead of cavity nest sites (De Graff et al 1991). These factors make this species not susceptible to a proposal such as this; and, in fact, the harvest openings will contribute to the preferred feeding sites until obscured by regeneration.

E. Western Big-eared Bat

The entire Salmon National Forest and most of the western United States is within the range of the western or Townsend's big-eared bat. However, very little is known about the suitability of or selection for forested habitats. Caves, abandoned mine tunnels and deserted buildings are known to be used by nursery colonies and for hibernaculum sites (Larrison and Johnson, 1981). None of these factors are known to exist within this analysis area. Therefore none of the proposed action alternatives are expected to have any direct or indirect effects on this species.

F. Boreal Owl

Hayward (1989) reported that all forested sites within the spruce-fir life zone are potential boreal owl habitat. He found owls nesting most frequently in mature or older stands located within subalpine fir habitat types but did not find lodgepole pine cover types used for nesting in Idaho. Nesting and calling sites were never located in dense even-age or young forest stands but were closely correlated with relatively high densities of trees greater than 15 inches dbh, open understories and multi-layered canopies. Boreal owls are secondary cavity nesters and most commonly utilize cavities that were created by pileated woodpeckers and flickers.

In this analysis area, none of Area I (i.e. the lower elevation portion) would constitute boreal owl habitat. The remaining 11,000 acres in Area II would only include 454 acres of harvest units. Of this 454 acres, or 4 percent of the area that would be harvested, less than 150 acres or 1.4 percent would be within cover types that may provide suitable nesting habitat for boreal owls. Since boreal owls actually utilize edges for feeding and since this proposal only affects a small percentage of the total area, any effects precipitated by an action alternative would have an insignificant impact upon boreal owl habitat suitability.

G. Northern Goshawk

The Northern goshawk breeds from western and central Alaska and northern Yukon to Labrador and Newfoundland, south to central California, southern New Mexico, western South Dakota, northern Minnesota and Connecticut and in the northern Appalachian Mountains (De Graaf et al. 1991).

Northern goshawks require dense mature to old growth conifer, mixed conifer/aspen or aspen stands for nesting in the Rocky Mountain region (Shuster 1980). Nests are commonly located at least 30 feet above the ground in forested areas with a closed canopy and little or no understory, and are often adjacent to open water. Nests are often used for several seasons (Call, 1978).

Goshawks are very efficient predators and take a wide variety of small mammal and bird prey species from the air, vegetation and/or ground. They hunt in dense forested areas, semi-forested areas, natural openings and over water, and utilize prey ranging from ducks to showshoe hares. Consequently, available prey base is seldom a limiting factor in Northern goshawk distribution and abundance.

Suitable nesting habitat in the form of mature to overmature conifer or mixed conifer/aspen stands, on the other hand, are apparently the most common limiting factor on this species. Any removal of mature conifer stands, particularly Douglas-fir, with an average dbh of 8 inches or greater, canopy closure of 40 percent or greater and at least 25 acres in size erodes the available nesting habitat for Northern goshawks.

For Analysis Area I, approximately 1,750 acres of this preferred habitat is currently present. The various action alternatives in this proposal would remove from 13 to 18 percent of this habitat. This could possibly affect one or more stands used as nest sites. However, preferred habitat would still be available throughout the area and actual abundance and/or distribution should not be affected.

Analysis Area II contains approximately 3,550 acres of old growth conifer habitat. However, this area is primarily covered by lodgepole pine and subalpine fir, and thus is much less preferred goshawk nesting habitat. From 8 to 15 percent of this habitat would be removed by the various action alternatives in this area. These alternatives should therefore not adversely affect goshawk distribution or abundance. Openings created in this densely forested area should increase diversity and abundance of prey species.

These two areas have not sustained previous timber harvest activities. Consequently, goshawk nesting habitat is currently available in pristine or natural quantity. The one nest site known to be present, in Analysis Area I, will not be disturbed by any of the currently proposed action alternatives. If other nest sites are located before or during the proposed sale activities appropriate mitigation measures will be implemented as per Forest Plan direction.

H. Spotted Frog

The spotted frog is a highly aquatic species found in the vicinity of cold permanent water, especially streams and springs (Stebbins, 1966). This species frequents both woods and meadows but does not seem to occur in warm or stagnant water. Spotted frogs migrate to upland areas in May and return to permanent water in July. Not much is known about terrestrial habitat needs of this species.

This proposal is not expected to have any effect upon spotted frogs because the only crossing on the only stream that may harbor them (Woodtick Creek) will be bottomless. In addition, there are no proposed harvest units closer than approximately 0.3 mile to this stream and most are further than 0.5 mile from it.

II. SENSITIVE PLANTS

The current Forest Service Region 4 Sensitive Plant Species list for the Salmon National Forest contains 12 species. Of these 12 species, only Lemhi beardtongue (*Penstemon lemhiensis*) may occur within the analysis area. This species is currently a Category 2 Candidate Species for Federal listing and is listed as an Idaho Threatened Species by the Conservation Center. This plant occurs in open sagebrush grasslands and open ponderosa pine forests in gravelly, rocky soils up to approximately 8,000 ft in elevation.

Recent field surveys indicate that this species is quite abundant on specific sites in this Forest and it has been located on all four Ranger Districts. To date, it has been located in the Panther Creek drainage but not within this analysis area. However, based upon other sites, it very likely occurs on the lower elevations (Area 1, as defined in CHapter 3 of this document) of this analysis area, below most of the proposed harvest activities.

This species is an early successional species that readily colonizes disturbed sites such as burned areas and road cut and fill slopes. For this reason, this proposed action is not expected to adversely affect this species and, if it is present but not detected, it would likely benefit from the proposed activities.

Bibliography

Call, M.W., 1978, *Nesting habitats and surveying techniques for common western raptors*. U.S. Department of Interior Bureau of Land Management Technical Note TN-316.

DeGraaf, R. M., V. E. Scott, R. H. Hamre, L. Ernst and S. H. Anderson. 1991. *Forest and Rangeland Birds of the United States: Natural History and Habitat Use*. USDA Forest Service. Ag. Handbook 688.

Hash, H. S. 1987. "Wolverine." In *Wild Furbearer Management and Conservation in North America*. eds., M. Novak, J.A. Baker, M.E. Obbard and B. Malloch, pp. 574-585. Ashton-Potter Limited: Concord, Ontario. 1150 pp.

Hayward, G. D. 1989. *Habitat Use and Population Biology of Boreal Owls in the Northern Rocky Mountains, USA*. University of Idaho: Moscow. (Ph.D. dissertation.)

Koehler, G. M. and J. D. Brittell. 1990. "Managing Spruce-Fir Habitat for Lynx and Snowshoe Hares." *J. of Forestry*. 88: 10-14.

Larrison, E. J. and D. R. Johnson. 1981. *Mammals of Idaho*. University Press of Idaho. 166 pp.

Larrison, E. J. 1981. *Birds of the Pacific Northwest*. University Press of Idaho. 337 pp.

Quinn, N. W. S., and G. Parker. 1987. "Lynx." In *Wild Furbearer Management and Conservation in North America*. eds., M. Novak, et. al., pp. 683-694. Ashton-Potter Limited: Concord, Ontario. 1150 pp.

Shuster, W.C. 1983. *Northern goshawk nest site requirements in the Colorado Rockies*. Western Birds 11:89-96.

Stebbins, R. C. 1966. *A Field Guide to Western Amphibians and Reptiles*. Houghton Mifflin Co.: Boston.

APPENDIX G2

BIOLOGICAL EVALUATION FOR SENSITIVE FISH SPECIES

Prepared for the Moyer Salt Timber Sale
Cobalt Ranger District
Salmon National Forest

Prepared by: Robert W. Rose, Fisheries Biologist

February 12, 1993

Introduction

This Biological Evaluation (BE) addresses the potential impacts of the proposed Moyer Salt Timber Sale, located within the Cobalt Ranger District of the Salmon National Forest, on Sensitive fish species. The Biological Evaluation process is intended to conduct and document activities necessary to ensure proposed management actions will not jeopardize the continued existence or cause adverse modification of habitat for species listed as Sensitive by the USDA Forest Service Intermountain Region (R4 USFS). Sensitive fish species occurring within the administrative boundaries of the Salmon National Forest include steelhead trout (*Oncorhynchus mykiss*), westslope cutthroat trout (*Oncoryhnchus clarki* var. *lewisi*), and bull trout (*Salvelinus confluentus*).

This BE was prepared by Robert Rose, Fishery Biologist, Salmon National Forest, in accordance with direction provided in Section 2672.42 of the Forest Service Manual (FSM), using documentation of sightings and suitable habitat during a site-specific field survey within the analysis area of the Moyer Salt Timber Sale, a literature review, and contact with professionals knowledgeable of species' habitat requirements. Findings and conclusions were reviewed by Bruce Smith, Forest Fishery Biologist, Dan Baird, Branch Chief; Range, Recreation, Watershed and Wildlife Branch, and John Burns, Forest Supervisor.

Consultation to Date

No formal or informal consultation with either the National Marine Fisheries Service (NMFS) or the U.S. Fish and Wildlife Service (USFWS) is required for Biological Evaluations of effects to sensitive species. These agencies have been appraised of the proposed Moyer Salt timber sale due to its potential effects to federally endangered Snake River sockeye salmon and federally endangered Snake River spring/summer chinook salmon, however. As separate Biological Assessment has been prepared to address effects to these species.

Current Management Direction

Anadromous Fisheries

The Salmon National Forest Land and Resource Management Plan (FLRMP)(USDA Forest Service, 1988) general objectives for anadromous Management Indicator Species (MIS) fish, including steelhead, are to rebuild adult populations to the 1960 level (FLRMP II-29). General Direction Statements specified in the FLRMP for MIS species are actions, measures, or treatments mandated for inclusion as integral components of management activities, or the environmental conditions expected to exist after such General Direction actions are implemented (FLRMP IV-5). General Direction Statements for Salmon National Forest anadromous MIS species mandate maintenance of stream habitats with adequate sediment-free spawning gravels, channels free of migration blocks, and ample instream flow and streamside cover (FLRMP IV-19). To meet Desired Future Conditions (DFC's) identified in the FLRMP for MIS fish species, aquatic habitats will be managed at a level sufficient to meet State water quality goals and maintain habitat capability to ensure a 68 percent fry survival rate for anadromous species (FLRMP IV-88).

A Habitat Management Action Plan for anadromous fish species occurring on the Salmon National Forest was developed in 1987. Forest habitats for anadromous fish species are additionally managed in accordance with other planning documents, including the USDA Forest Service Western Anadromous Fish Habitat Program Plan, 1986-1990 (1986), the Columbia River Fish Management Plan (1988), the Columbia Basin Salmon and Steelhead Production Plan for the Salmon River Sub-Basin (1990), the Idaho Department of Fish and Game Fisheries Management Plan, 1991-1995 (1991), the Columbia River Basin Fish Habitat Management Policy Implementation Guide (1991), and the Salmon

National Forest Columbia River Basin Fish Habitat Management Policy Implementation Guide Implementation Plan of 1991. No Regional conservation strategy has as yet been developed for steelhead, however.

Resident Fisheries

General Direction Statements for Salmon National Forest resident MIS species mandate maintenance of cool, clean sediment-free stream and lake habitats, with ample instream flow and and streamside cover (FLRMP IV-19). To meet Desired Future Conditions (DFC's) identified in the FLRMP for resident MIS fish species, aquatic habitats will be managed at a level sufficient to meet State water quality goals and maintain habitat capability to ensure a 60 percent juvenile fry survival rate (FLRMP IV-88).

A Habitat Management Action Plan for resident fish species occurring on the Salmon National Forest was developed in 1987. Forest habitats for resident fish are additionally managed in accordance with (1990), the Idaho Department of Fish and Game Fisheries Management Plan, 1991-1995 (1991). No Regional conservation strategy has as yet been developed for either westslope cutthroat trout or bull trout.

Proposed Action

As part of the Forest Plan implementation process, the Cobalt Ranger District of the Salmon National Forest is proposing the Moyer Salt and Salt Creek Timber Sale (hereafter referred to as the Moyer Salt Timber Sale) within the Taylor Mountain Roadless Area (No. 13-902)(See Moyer Salt Timber Sale EIS, Figure 1). Within an array of six action alternatives, the Forest proposes to construct between 15.7 and 17.8 miles of road, and harvest between 3.75 and 6.90 mmbf of timber on 440 to 847 acres within the upper Woodtick Creek watershed and the upper Salt and "Perm" Creek drainages of the Moyer Creek watershed (See Moyer Salt Timber Sale EIS). These proposed actions are designed to help achieve the silvicultural goals and objectives of the 1988 Salmon National Forest Land and Resource Management Plan (Forest Plan)(USDA Forest Service, 1988) to help satisfy the short-term demand for timber while providing for community stability and maintenance of a continuous supply of timber for the future. As required under the National Environmental Policy Act,, a No Action alternative is additionally included within the array of proposed alternatives.

Existing Environment

Affected Streams

The analysis area encompasses portions of the Woodtick Creek and Moyer Creek watersheds. The 32.9 square mile Moyer Creek basin and 16.0 square mile Woodtick Creek basin lie within the 529 square mile Panther Creek drainage system, a major tributary of the mainstem Salmon River. Within the Woodtick Creek drainage system, proposed activities have the potential to impact mainstem Woodtick Creek and the lower reach of Goodluck Creek. Both streams are perennial and possess sufficient flow volume and aquatic habitat capability to support substantial fisheries resources. The analysis area also encompasses an unnamed, largely intermittent tributary stream which enters Woodtick Creek approximately 1.7 miles downstream of the mouth of Goodluck Creek (Township 19 N, Range 19 E, Section 3) (Figure 2-1). Within the Moyer Creek drainage, the analysis area encompasses Salt Creek and an unnamed perennial stream locally known as "Perm" Creek, which joins Moyer Creek in Township 19 N, Range 18 E, Section 24. Salt Creek is of sufficient size in its lower reaches to provide supplemental spawning and/or rearing habitat to fisheries resources in the Moyer Creek drainage and may additionally support a minor resident population through its mid reaches. The smaller "Perm" Creek appears to provide only marginal spawning or rearing capabilities in its

lowermost reach. Specific alternatives also encompass portions of the Pete's Gulch drainage, which is not believed to support fish life.

Affected Sensitive Species

Listed R4 sensitive aquatic species known to occur within the Panther Creek system include steelhead (*Oncorhynchus mykiss*), westslope cutthroat trout (*Oncorhynchus clarki* var. *lewisi*), and bull trout (*Salvelinus confluentus*). Current information from Salmon National Forest aquatic habitat and resource files, however, indicate that bull trout are the only R4 sensitive fish species currently utilizing the Moyer Creek and Woodtick Creek portions of this system.

Anadromous Fisheries

The Panther Creek drainage system was historically a major producer of both summer steelhead and spring/summer chinook salmon (Reiser, 1986). Utilization of Panther Creek and its tributaries by anadromous salmonids began to decline in the 1940s, however, and has been severely limited since the 1960s by chemical pollution of mid and lower mainstem waters that is attributable to operation of the Blackbird Mine (Reiser, 1986; Idaho Department of Fish and Game, 1965). Despite these mainstem water quality problems, Panther Creek and its historically utilized tributaries, including Moyer and Woodtick Creeks, continue to be regarded as potentially viable producers of anadromous fish (Northwest Power Planning Council, 1991). The Forest Plan calls for continued management directed toward anadromous stocks in anticipation of correction of mine drainage problems and recovery of mainstem water quality (USDA Forest Service, 1988). Idaho Department of Fish and Game management prescriptions for the two streams calls for a preservation management strategy for anadromous fish stocks, which maintains a harvest closure and may supplement natural recruitment with possible stockings of fry or fingerlings (Idaho Department of Fish and Game, 1991).

In terms of potential production capability, the Moyer Creek drainage has been identified as the most important steelhead spawning tributary of the Panther Creek drainage system, with production capability estimated at 7,300 smolts annually. Annual steelhead production capability within the Woodtick Creek system has been estimated at 1,300 smolts (Northwest Power Planning Council, 1991).

Resident Fisheries

The mainstem reaches of Woodtick Creek and Moyer Creek both support well-established populations of resident salmonids. Bull trout are known to be present in both streams, along with resident populations of rainbow trout (Buram et al, 1990). Mountain whitefish additionally utilize mainstem habitats within Moyer Creek (Burum et al, 1990, amended). Although westslope cutthroat trout are infrequently caught in the mainstem reaches of Panther Creek above the mouth of Moyer Creek (Tambe, 1989, personal communication), no evidence of direct utilization of either Moyer Creek or Woodtick Creek by this species can be found.

Resident trout production capabilities of Woodtick Creek and Moyer Creek are each estimated at 40 pounds of fish per surface acre (May, 1985). Mainstem Moyer Creek, with an existing road paralleling approximately half its length, receives significant fishing pressure during the summer months. Due to closure of Forest Service Road 107, angling opportunities in Woodtick Creek are accessed only by foot or horseback from Panther Creek via the Woodtick Trail, which diverges from the stream below the analysis area.

Woodtick Creek Fish Habitat

Within the lower portion of the analysis area (Township 19 N, Range 19 E, Section 4), Woodtick Creek is a moderate gradient B type channel (Rosgen, 1985) with an average width slightly greater than 12

feet. The stream has a mean annual discharge of approximately nine cubic feet per second (cfs), an estimated peak discharge of 80 cfs, and mean monthly flows ranging between approximately three and 36 cfs, all as measured near the streams confluence with Panther Creek (Rose, 1988). The stream exhibits a diverse variety of microhabitats produced largely as a result of an abundance of large woody debris within the channel. Lateral scour pools and dammed pools with water depths of up to three feet are common and provide abundant adult rearing habitat. Numerous shallow edgewater areas and backwater pools contribute to provide dispersed rearing habitat for juvenile life stages.

Stream substrates in this area are dominated by angular quartzite rubble, with smaller gravel accumulations behind obstructions providing small pockets of spawning habitat. Gravels that are relatively free of fine-grained sediment reflect the largely undisturbed nature of this portion of the drainage. Sediment core sampling conducted during the 1992 field season revealed a mean of 15.0 percent fines-by-depth at likely steelhead spawning sites. This level of substrate fines is among the lowest value recorded for Salmon National Forest streams, falling well below Forest Plan standards and guidelines of less than 20.0 percent fines for anadromous fish spawning habitat and less than 28.7 percent for resident fish spawning habitat (FLRMP II-21, II-23). This stream is one of few on the Salmon National Forest whose substrate quality exceeds maximum biotic potential for resident fisheries production, identified in the FLRMP as those streams displaying substrate fines-by-depth of less than approximately 18.5 percent (FLRMP II-23).

Despite a low bank rock content, excellent streambank stability is afforded by a well-established carpet of mosses extending to the water's edge. Streambanks show no evidence of past ungulate damage. In this reach, tall Englemann spruce within the valley bottom provide over 40 percent midday stream shading and up to 75 percent morning and afternoon shading. Minor amounts of supplemental shade are provided by understory vegetation.

An existing 60-inch culvert on Road #107 in the lower portion of the analysis area (Township 20 N, Range 19 E, Section 32) currently poses a barrier to upstream anadromous and resident fish passage under high water conditions.

Within Township 19 N, Range 19 E, Section 3, a large blowdown event has removed most of the tall valley bottom spruce, reducing stream shading to less than 10 percent through a quarter-mile-long reach. Shade canopy in this area is provided intermittently by 10 to 20 foot tall subalpine fir, with the larger accumulations of downfall providing localized shade from direct sun.

Above the blowdown area stream shading of up to 70 percent is restored by a dense spruce canopy. Stream character and aquatic habitat in this reach is similar to that in the lower area, although average stream width is reduced to approximately six to eight feet. Dammed and lateral scour pools as much as two feet deep are abundant.

Goodluck Creek displays significant channel migration at its confluence with Woodtick Creek. Braiding of the stream due to flow obstruction by downfall materials has resulted in an undefined channel mouth, which drops three vertical feet into the Woodtick Creek channel. No pool has formed at this confluence, effectively precluding upstream passage from Woodtick Creek into Goodluck Creek during low flow periods.

Above their confluence Woodtick and Goodluck Creeks are about equal in size and character, with average stream widths of approximately five to six feet and abundant debris-formed pools as much as one and one-half feet deep. Substrate materials in both streams in this area become dominated by cobbles with minor amounts of gravel. Within 100 yards of its mouth, Goodluck Creek exhibits a short but sharp increase in stream gradient before once again flattening out in the vicinity of the proposed road crossing. Above the confluence of Goodluck Creek, Woodtick generally retains the step cascade and high gradient riffle characteristics of the stream below the confluence, but displays significant regions of channel braiding which may define the upper limit of fish passage.

Minimum and maximum water temperatures recorded at the mouth of Woodtick Creek between June and October 1992 ranged from 36 to 61 degrees Fahrenheit (Carter, 1992). Beneficial use temperature criteria for Coldwater Biota (IDAPA 16.01.2250,04.c) was met during all months sampled. Temperature criteria for Salmonid Spawning (IDAPA 16.01.2250,05.c) was met for the entire fall spawning and incubation period, and all but the very end of the spring spawning and incubation period identified for waters of the Salmon National Forest (Idaho Department of Water Resources, 1975). The brief exceedence of Salmonid Spawning beneficial use criteria to a temperature maxima of 61 degrees during the latter half of June is most likely attributable to an unseasonable transitory warm spell, as maxima for the July sampling period fell back to 50 degrees. pH readings taken during this same June through October sampling period ranged between 7.5 and 8.0 (Carter, 1992), falling well within the range of 6.7 to 8.2 which encompasses 90 percent of the freshwater areas harboring good aquatic faunas (Leitritz and Lewis, 1976), as well as within the pH criteria range for both Cold Water Biota (IDAPA 16.01.2250,04.b) and Salmonid Spawning (IDAPA 16.01.2250,05.b). Dissolved oxygen content at the mouth of Woodtick Creek also exceeded the 6 milligram per liter/90 percent saturation beneficial use criteria for both Cold Water Biota (IDAPA 16.01.2250,04.a) and Salmonid Spawning (IDAPA 16.01.2250,05.a) throughout the sampling period, ranging from nine to 11 milligrams per liter (Carter, 1992).

The benthic macroinvertebrate communities of Woodtick and Goodluck Creeks in the proposed sale area are comprised primarily of stonefly and mayfly species, indicating both cold, well oxygenated water of good chemical quality, and clean substrates relatively free of sediment deposition. Caddisfly species appear to be somewhat underrepresented in these streams (Rose, 1989-1990; 1991). Lafontaine (1981) has identified both extreme seasonal flow variations or consistently cold water as primary factors limiting caddis populations within trout streams. Baseline aquatic habitat data collected during the 1992 field season (Carter, 1992) suggests that this latter factor is primarily responsible for the apparently depressed caddis populations within Woodtick Creek.

Moyer Creek Basin Fish Habitat

Salt Creek and "Perm" Creek are both small perennial streams whose fisheries habitats are largely limited to their lowermost reaches and where low gradient gravel-bottomed riffles and small pools provide supplemental spawning and nursery habitat to mainstem Moyer Creek fish populations. Although nursery habitats could be used by both resident and anadromous stocks, spawning habitats in these lower reaches are more suitable for resident fish. Additional minor habitat for resident fish populations may occur in the middle reaches of Salt Creek.

The existing culverts near the mouths of Salt and "Perm" Creeks have not been identified as passage barriers. Spawning and rearing reaches above these culverts appear to be more accessible to the spring-spawning rainbow trout than to fall-spawning bull trout, due to improved passage conditions during the spring runoff period. Low flow access is particularly questionable in "Perm" Creek, which exhibits significant braiding immediately above the culvert.

While providing relatively minor amounts of supplemental habitat to the Moyer Creek system, both Salt Creek and "Perm" Creek serve important contributory functions to the maintenance of water quality within the larger Moyer Creek system. In its lower reaches (Township 20 N, Range 18 E, Section 35), mainstem Moyer Creek alternates between moderate and low gradient B and C channels, with an average bankfull width of approximately 21 feet. The stream has a mean annual discharge of approximately 19 cubic feet per second (cfs), an estimated peak discharge of 85 cfs, and mean monthly flows ranging between approximately six and 77 cfs, all as measured approximately one eighth mile above the streams confluence with Panther Creek (Rose, 1988). Minimum and maximum water temperatures recorded at the mouth of Moyer Creek between June and October 1992 ranged from 32 to 54 degrees Fahrenheit (Carter, 1992). Beneficial use temperature criteria for Coldwater Biota (IDAPA 16.01.2250,04.c) was met during all months sampled, but temperature criteria for Salmonid Spawning (IDAPA 16.01.2250,05.c) was exceeded during both the end of the

spring spawning and incubation period and the early and mid portions of the fall spawning and incubation period identified for waters of the Salmon National Forest (Idaho Department of Water Resources, 1975). The brief exceedence of Salmonid Spawning beneficial use temperature criteria during the latter half of June is most likely attributable to an unseasonable transitory warm spell, while the exceedence during July, August, and September reflects the more open nature of the Moyer Creek stream channel, which exacerbated drought-induced conditions of summer low flow warming. pH readings taken during this same June through October sampling period ranged between 7.0 and 7.7 (Carter, 1992), falling well within the range of 6.7 to 8.2 which encompasses 90 percent of the freshwater areas harboring good aquatic faunas (Leitritz and Lewis, 1976), as well as within the pH criteria range for both Cold Water Biota (IDAPA 16.01.2250,04.b) and Salmonid Spawning (IDAPA 16.01.2250,05.b). Dissolved oxygen content at the mouth of Moyer Creek also exceeded the 6 milligram per liter/90 percent saturation beneficial use criteria for both Cold Water Biota (IDAPA 16.01.2250,04.a) and Salmonid Spawning (IDAPA 16.01.2250,05.a) throughout the sampling period, ranging from nine to 11 milligrams per liter (Carter, 1992).

Past Actions That Affect the Present Condition

Previous timber management activities within the Moyer-Salt Timber Sale analysis area include the 1988 Tick Creek Timber Sale, which harvested 23.0 percent of the Little Woodtick Creek drainage. This level of of harvest has been shown to produce significant increases in water yield within a drainage (Troendle and Leaf, 1980, as cited by Troendle, 1982), and was believed to be the factor responsible for an apparent increase in peak runoff flow within the Little Woodtick Creek drainage during the 1991 water year (Elizabeth Rieffenberger, 1992, personal communication). Within the larger Woodtick Creek drainage, the Tick Creek Sale corresponded to a 5.2 percent harvest of the total drainage basin. The increased magnitude of peak flow observed within the Little Woodtick Creek drainage was not believed to have produced any deleterious impacts to mainstem Woodtick Creek (Elizabeth Rieffenberger, 1992, personal communication) due to variation in the timing of peak runoff between the two streams.

Effects of the Proposed Project

Potential Effects of Timber Harvest Activities

The potential effects of timber harvest activities on fisheries resources are primarily related to impacts on stream substrates, fish migration opportunities, riparian area integrity, and streamflow magnitude and timing. Forest transportation systems which are poorly designed or lacking in effective mitigation measures can have significant effects on fish and their habitats as a result of direct deposition of sediment into stream channels (Yee and Roelofs, 1980). Incremental sediment contribution per unit area as a result of poor road design can potentially exceed that from all other land management activities, including log skidding and yarding (Yee and Roelofs, 1980). Excess sediment production can adversely affect fish habitat by reducing substrate permeability (Wicket, 1958; Mcneil and Ahnell, 1964), impeding or preventing fry emergence (Koski, 1966; Bjornn, 1969), and reducing rearing and overwintering habitat (Phillips, 1970). Increased sedimentation of stream substrates are also associated with decreased diversity of cover for bottom fauna (Sprules, 1947; Kimble and Wesche, 1975). Massive increases in sediment production may exceed the stream's ability to transport the load that has been introduced (Leopold, 1964).

Improperly designed road culverts associated with stream crossings have the potential to create barriers to fish migration, usually because of excessive outfall heights or water velocities, insufficient water depths, lack of resting pools, or combinations of these factors (Evans and Johnson, 1974; Yee and Roelofs, 1980).

Riparian vegetation serves an important role in stabilizing banks, providing summer stream shading and winter thermal cover, contributing organic matter and terrestrial insects to the stream, and serving as a buffer against sediment transport into stream channels (Meehan et al, 1977; Yee and Roelofs, 1980). Improper timber harvest techniques which result in the removal of riparian vegetation or streamside shade trees have the potential to increase summer water temperatures, decrease winter water temperatures, and adversely affect egg incubation (Greene, 1950; Chapman, 1962). Removal of overhanging vegetative cover can result in increased predation and reduction of preferred juvenile salmonid microhabitats (Chapman, 1966; Allen, 1969), and accelerated formation of anchor ice (Bruce Smith, 1991, personal communication).

Timber harvest encompassing more than 20 to 30 percent of a drainage's total basin area has been shown to be capable of producing modifications to peak runoff flow timing and magnitude (Troendle and Leaf, 1980, as cited by Troendle, 1982). Extensive timber harvest activity within a drainage has the potential to increase water yields and peak flows to a point that channel erosion occurs (Rosgen, 1978).

Direct and Indirect Effects of Alternative 1 (No Action)

No road construction or timber harvest activities would be implemented under this alternative. There would be no direct or indirect effects on fisheries resources within the analysis area due to activities associated with timber harvest. The aquatic habitats of Woodtick Creek, Goodluck Creek, Salt Creek, and "Perm" Creek would remain generally unchanged from conditions described in Chapter 3, except for minor natural changes in channel structures related to continued introduction of large woody debris as trees die and fall down. Naturally-occurring events such as fire or floods may cause changes to fish habitat as a result of vegetation disturbance, increases in flow, or other events. Angler access and harvest of resident fish species in Woodtick Creek, Goodluck Creek, and Salt Creek would remain essentially unchanged from current levels. Future utilization of steelhead habitat within the Woodtick Creek drainage, and steelhead and chinook salmon habitat within the Moyer Creek drainage, would be dependent upon improvement of water quality in Panther Creek. Under the No Action alternative, the existing culvert at the crossing of Woodtick Creek by F.S. Road 107 in Township 20 N, Range 19 E, Section 32 (Figure 2-1) would not be repaired or replaced through timber-related funding, and would continue to be a barrier to upstream migration of both anadromous and resident fish unless scheduled for repair or replacement via Fisheries Department project funding. Due to the current emphasis on correction of migration barriers on streams supporting chinook salmon stocks, it is unlikely that restoration of potential steelhead passage at the Woodtick culvert site via Fisheries funding would receive a high priority at this time (Bruce Smith, 1993, personal communication).

Direct and Indirect Effects Common to All Action Alternatives

Primary considerations of any assessment of potential effects of road construction and timber harvest on TES fish species are sedimentation of stream substrates, degradation of riparian area integrity, impairment of migration opportunities, and modification of annual streamflow patterns. Salmon National Forest soil and water Best Management Practices (BMPs) and site-specific soil, water, and fisheries mitigation measures identified in Chapter II of the Moyer-Salt Timber Sale Draft EIS are designed to 1) minimize and intercept sediment generated as a result of road construction or timber harvest before it can enter stream channels, 2) maintain riparian integrity to ensure adequate shading of stream channels and retention of protective overhead cover, 3) accommodate species-specific migration needs at transportation route crossings of streams containing fisheries resources, and 4) constrain basin harvest intensity to levels which do not produce significant modification of peak streamflow intensities and/or timing.

Road construction and timber harvest activities proposed for this timber sale will be concentrated to a large extent on mid or upper slopes of the Woodtick, Salt and "Perm" Creek drainages. Only six of 32 proposed cutting units will be located at distances within 200 feet of active stream channels. At

these sites, filter strip widths consistent with Forest Plan direction will be employed to intercept sediment before reaching stream channels. Additionally, these buffers will be maintained in an uncut status to retain existing ground cover within riparian areas, ensure adequate shading of active stream channels, maintain streambank stability, and provide for future recruitment of large organic debris.

Under the various proposed alternatives, stream crossings will be required on Woodtick, Goodluck, Perm, and Salt Creek. At all stream crossings where fish are known or suspected to occur, design criteria will ensure yearround fish passage opportunities. Installation activities will be timed to precede the bull trout spawning period, and will be consistent with Forest guidelines (see "Performance Criteria to be Observed to Protect Stream Channels", Appendix C) to ensure minimal water quality and stream substrate impacts below construction sites. Additionally, an existing 60 inch culvert on Woodtick Creek (Section 32 of Township 20 N, Range 19 E) which currently presents a barrier to migration of both resident and anadromous fish is to be repaired or replaced under a variety of funding mechanisms dependent upon the selected action alternative. Correction of this barrier will reopen access to potential steelhead spawning habitat within the upper reaches of Woodtick Creek. Localized construction-related impacts to stream substrates at this site are expected to be ameliorated within the time frame of natural or enhanced recovery of mainstem Panther Creek water quality.

Under the most timber-intensive proposed harvest alternative, total basin harvest would be limited to 3.0 percent of the Woodtick Creek drainage, 14.3 percent of the Salt Creek drainage, and 14.2 percent of the "Perm" Creek drainage. This level of basin disturbance would be substantially below the 20 to 30 percent regarded as capable of producing significantly increased water yield (Troendle and Leaf, 1980, as cited by Troendle, 1982) in the Woodtick Creek drainage, and would approach but not reach these levels in the previously undisturbed Salt and "Perm" Creek drainages of the Moyer Creek system. Proposed harvest prescriptions under other alternatives identified within the Moyer-Salt Draft EIS would impact substantially less of the Salt and "Perm" Creek drainage basins.

Direct and Indirect Effects Specific to Alternative 2

This alternative would require road crossings of Woodtick Creek, Goodluck Creek, Salt Creek, "Perm" Creek, and an unnamed tributary of Woodtick Creek. Fish passage at the existing road culvert on FS Road 107 (Township 20 N, Range 19 E, Section 32) would be restored in association with Knudson-Vandenberg (KV) funding, while construction design would maintain fish passage at the required new crossings of upper Woodtick Creek (Township 19 N, Range 19 E, Section 11) and Goodluck Creek (same legal)(Figure 2-2). Under the transportation system associated with this alternative, the Salt Creek crossing would be located in the headwaters area of the drainage (Township 19 N, Range 19 E, Section 16)(Figure 2-2). The natural diminished aquatic habitat capability at and above this location does not warrant a crossing design which would ensure fish passage at this site. A single crossing of "Perm Creek" would be required in Township 19 N, Range 19 E, Section 17 (Figure 2-2) under this alternative. Fish passage capability would not be maintained at this crossing due to lack of aquatic habitat capability at and above this sites. A crossing structure would additionally be required across an unnamed tributary of Woodtick Creek (Township 19 N, Range 19 E, Section 10)(Figure 2-2). Although this tributary is live at the proposed crossing location, it is intermittent throughout the majority of its length and is not believed to support fish life. Installation of standard culvert designs at the crossing locations of Salt Creek, "Perm" Creek, and the unnamed Woodtick Creek tributary would have no long-term impact on the fisheries resources of the Moyer or Woodtick Creek drainages. Adherence to Forest Plan standards and guidelines would minimize short-term sediment and turbidity-related impacts to downstream water quality during construction activities at all crossing locations.

BOISED modeling of the transportation system and harvest prescriptions associated with this alternative indicates that sediment delivery rates to Moyer Creek and Woodtick Creek would fall within the middle of the range predicted for the array of alternatives, being higher than the predicted rates for Alternatives 1 and 5, but lower than the rates predicted for Alternatives 3, 4, and 6 (Table II-2).

Mitigation measures identified in Chapter 2, and applicable soil and water Best Management Practices (BMPs) are expected to be fully successful in protecting the aquatic habitats of these two drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of the project FEIS.

Timber harvest activities would impact 9.1 percent of the Salt Creek drainage and 11.3 percent of the "Perm" Creek drainage under this alternative. As these levels of basin harvest are well below the 20 to 30 percent basin harvest threshold levels observed to result in significant changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982), no impacts to the natural flow regimes of these streams would be expected under this alternative.

Direct and Indirect Effects Specific to Alternative 3

The transportation system for this alternative would require two crossings of "Perm" Creek rather than the single crossing required under alternative 2. An upper crossing would be located in Township 19 N, Range 19 E, Section 17, as in Alternative 2, and a lower crossing would be located in Township 19 N, Range 19 E, Section 18 (Figure 2-3). Fish passage would not be maintained at either of these two crossings, due to the lack of suitable fish habitat at and above these sites. Crossing locations of upper Woodtick Creek, Goodluck Creek, and the unnamed Woodtick Creek tributary would remain as described for Alternative 2, with fish passage capabilities being maintained at the upper Woodtick Creek and Goodluck Creek sites. Fish passage at the existing FS Road 107 culvert (Township 20 N, Range 19 E, Section 32, Figure II-3) would be restored in association with prescribed road reconstruction operations.

This alternative would additionally relocate the Salt Creek stream crossing to Township 19 N, Range 19 E, Section 7, and the crossing of the unnamed Woodtick Creek tributary to Township 19 N, Range 19 E, Section 10 (Figure II-3). Because it would be located in the middle reaches of the drainage, the Salt Creek stream crossing must be designed to ensure unrestricted fish passage under this alternative.

Culvert installation operations would temporarily increase water turbidities in Woodtick Creek, Goodluck Creek, the unnamed Woodtick Creek tributary, Salt Creek and "Perm" Creek at and below these crossing locations and may produce short-term sediment impacts to localized areas below these sites. Installation of these crossing structures in accordance with "Performance Criteria to be Observed to Protect Stream Channels" (FSM 2505.1-2, FEIS Appendix B) would minimize the spatial and temporal scope of installation impacts. The narrow valley bottom and steep sideslopes adjacent to the proposed Salt Creek crossing preclude flat, perpendicular approaches to this site, however. Further, these steep sideslopes inhibit the implementation of adequate soil and water mitigation measures between the road fill slope and the Salt Creek stream channel. These site specific limitations, coupled with the determination of BOISED, which indicates that alternative would produce the greatest longterm sediment delivery rates of the seven alternatives analyzed, together produce an increased risk of surface erosion and consequently an associated increased risk of failure to continuously meet State water quality standards within Salt Creek stream channel (see FEIS Hydrology Effects). As this crossing is located lower in the Salt Creek drainage than those proposed under other action alternatives, any long term stream sedimentation resulting from unchecked overland erosion would impact potential rearing habitats within that stream and, to a lesser degree, Moyer Creek below the confluence of Salt Creek.

Under this alternative timber harvest activities would impact 4.5 percent of the Salt Creek drainage and 11.3 percent of the "Perm" Creek drainage. This represents the lowest level of harvest within the Salt Creek drainage of the six alternatives considered. No impacts to the natural flow regimes of either Salt Creek or Woodtick Creek would be expected at these disturbance levels.

Direct and Indirect Effects Specific to Alternative 4

The transportation system associated with this alternative utilizes the proposed extension of F.S. Road 106, as in Alternative 2, reconstruction of the existing F.S. Road 107, and further extension of F.S. Road 107 one additional mile into the Woodtick Creek and Pete's Gulch drainages (Figure 2-4). Stream crossing locations would be identical to those described for Alternative 2. Because the additional roading required under this alternative is located entirely on upper-slope portions of the Woodtick Creek and Pete's Gulch basins, no additional road-related impacts to aquatic resources would be anticipated from those described under Alternative 2.

BOISED modeling of the effects of the transportation system and harvest prescriptions associated with this alternative indicates that sediment delivery rates to Moyer Creek and Woodtick Creek would be the second highest of the seven alternatives analyzed. Mitigation measures identified in Chapter 2, and applicable soil and water Best Management Practices (BMPs) are, however, expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of the FEIS.

Timber harvest prescriptions are maximized under this alternative. Potential effects to fisheries are primarily related to possible increases in peak flow intensities resulting from intensive harvest of the Salt Creek and "Perm" Creek drainages. Proposed harvest operations under this alternative would encompass 14.3 percent of the Salt Creek drainage and 14.2 percent of the "Perm" Creek drainage. While the most intensive of the various harvest proposals, basin disturbance under this alternative would not approach threshold levels observed to result in significant increases in annual water yield and peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982). As unmitigated potential sediment impacts to Salt Creek, "Perm" Creek, and Moyer Creek from increased peak flow intensity are not anticipated, implementation of this alternative would not be expected to adversely affect fisheries resources within the Moyer or Woodtick Creek drainage systems.

Direct and Indirect Effects Specific to Alternative 5

This alternative requires the least new roadbuilding of the six action alternatives. Woodtick Creek would be the only stream crossed by the associated transportation system. Fish passage at the existing culvert at Township 20 N, Range 19 E, Section 32 (Figure 2-5) would be restored in association with the required reconstruction of FS Road 107 associated with this alternative.

BOISED sediment modeling results for this combination of roads and cutting units indicate that this alternative would yield the second lowest amount of sediment to the Moyer Creek and Woodtick Creek drainages of the seven alternatives analyzed, and the lowest amount of sediment of the six action alternatives. Mitigation measures identified in Chapter 2, and applicable soil and water Best Management Practices (BMPs) are expected to be fully successful in protecting the aquatic habitats of these two drainages. Results and analysis of BOISED sediment modeling are discussed in greater detail within the Hydrology section of the FEIS.

Under this alternative timber harvest activities would impact 5.1 percent of the Salt Creek drainage and 4.3 percent of the "Perm" Creek drainage. This represents the lowest level of harvest within the "Perm" Creek drainage and the second lowest level of harvest within the Salt Creek drainage of the six alternatives. No impacts to the natural flow regimes of these streams would be expected at these disturbance levels (Troendle and Leaf, 1980, as cited by Troendle, 1982).

Direct and Indirect Effects Specific to Alternative 6

The transportation system of this alternative is identical to that of Alternative 4. As sediment generated by road construction activities comprises the major component of overall yield, land disturbance

reductions associated with the application of diversified forestry harvest strategies within units otherwise scheduled for clearcutting under Alternative 4 represents a relatively minor factor in the overall level of sediment generation under this alternative. The predicted BOISED sediment yield for this alternative, as a result, would be essentially the same as that generated under Alternative 4 (Table II-2). As with Alternative 2, mitigation measures identified in Chapter 2, and applicable soil and water Best Management Practices (BMPs), are therefore expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of the FEIS.

Proposed harvest operations under this alternative would encompass 12.3 percent of the Salt Creek drainage and 13.1 percent of the "Perm" Creek drainage. Due to the reduction of harvest within 15 units otherwise slated for clearcutting, this alternative represents a 14.0 percent reduction in Salt Creek basin harvest, and a 7.8 percent reduction in "Perm" Creek basin harvest, relative to alternative 4. As with alternative 4, these levels of basin harvest, though among the highest of the alternatives considered, do not approach the threshold levels observed to result in significant changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982).

Direct and Indirect Effects Specific to Alternative 2a

The transportation system of this alternative is identical to that of Alternative 2. As with that alternative, fish passage at the existing road culvert on FS Road 107 (Township 20 N, Range 19 E, Section 32) would be restored through Knudson-Vandenberg (KV) funding, rather than in direct association with road reconstruction operations.

As indicated in the discussion for Alternative 6, sediment generated by road construction activities comprises the major component of overall sediment yield from timber sale activities. Land disturbance reductions associated with the application of diversified forestry harvest strategies within units otherwise scheduled for clearcutting under Alternative 4 therefore represents a relatively minor factor in the overall level of sediment generation under this alternative. The predicted BOISED sediment yield for this alternative, as a result, is essentially the same as that generated under Alternative 2 (Table II-2). As with Alternative 2, mitigation measures identified in Chapter 2, and applicable soil and water Best Management Practices (BMPs), are therefore expected to be fully successful in protecting the aquatic habitats of the Woodtick Creek and Moyer Creek drainages. Results and interpretation of BOISED sediment modeling are discussed in greater detail within the Hydrology Effects section of the FEIS.

Proposed harvest operations under this alternative would encompass 8.2 percent of the Salt Creek drainage and 10.4 percent of the "Perm" Creek drainage. Due to the reduction of harvest within 21 units otherwise slated for clearcutting, this alternative represents a 9.9 percent reduction in Salt Creek basin harvest, and a 8.0 percent reduction in "Perm" Creek basin harvest, relative to alternative 2. As with alternative 2, these levels of basin harvest are well below the threshold levels observed to result in significant changes in annual water yield or peak flow intensity (Troendle and Leaf, 1980, as cited by Troendle, 1982).

Cumulative Effects

Harvest operations within the Woodtick Creek drainage associated with the 1988 Tick Creek Timber Sale have impacted 23 percent of the Little Woodtick Creek drainage. Post-sale field review of the area by the Forest Hydrologist in 1991 indicated that an increase in water yield directly attributable to intensive timber harvest had produced deleterious sedimentation in Little Woodtick Creek below the sale area (see FEIS, Affected Environment, Hydrology). Sedimentation effects appeared to be confined to Little Woodtick Creek and were not believed to have impacted fish-bearing waters of mainstem Woodtick Creek. The increased water yield observed in Little Woodtick Creek as a result

of intensive harvest within that drainage is not thought to have produced any measurable effects on the intensity or timing of peak flows in mainstem Woodtick Creek, due to dissimilarities in the timing of runoff in the two streams.

This 23 percent disturbance of the Little Woodtick Creek drainage corresponds to 5.2 percent of the total Woodtick Creek drainage. The various timber harvest prescriptions proposed under the Moyer Salt timber sale would impact an additional 1.8 to 3.0 percent of the total Woodtick Creek drainage, bringing cumulative land disturbance within the drainage to 7.0 to 8.2 percent. As this level of disturbance would be substantially below the 20 to 30 percent regarded as capable of producing significantly increased water yield (Troendle and Leaf, 1980, as cited by Troendle, 1982), no further fisheries impacts related to cumulative land disturbance in the Woodtick Creek drainage would be anticipated under any of the proposed Moyer Salt action alternatives.

Reasonably foreseeable future activities within the analysis area include timber stand improvement (TSI) operations within all shelterwood units, post and pole sales, and public firewood salvage. No additional road construction would be needed to implement these post-sale activities, and no new commercial sawtimber sales are proposed within the analysis area within the current planning period. Consequently, cumulative impacts to aquatic habitats encompassing post-sale activities would be limited to those described in the preceding sections. Only a very minor and short-lived increase in consumptive harvest of resident fish would be expected in association with any open-access public firewood gathering in the Woodtick Creek area.

Consistency with Forest Plan Standards and Guidelines

All action alternatives except Alternative 3 are expected to provide a level of fish habitat protection consistent with Forest Plan guidelines. Alternative 3 exhibits an high inherent risk of failure to meet water quality standards, due to the site specific inability to adequately protect water quality and stream substrates in the vicinity of the proposed Salt Creek crossing site. Additionally, Alternative 1, the No Action alternative, is not consistent with Forest Plan guidelines because the current fish passage problem on Woodtick Creek would most likely continue. No funding mechanisms to repair or replace this culvert would be implemented under this alternative. This barrier could be corrected at some time under another program such as the Salmon National Forest Fisheries Program, but priority for scheduling of such a repair via this funding mechanism would fall below restoration of migration opportunities in streams supporting Federally threatened Snake River spring/summer chinook salmon.

Determinations

Steelhead

Based upon analysis of the effects of the proposed alternatives, and contingent upon implementation of Salmon National Forest soil and water Best Management Practices (BMPs) and site specific soil, water and fisheries mitigations as identified within the FEIS, it is my determination that Alternative 1 of the proposed Moyer Salt Timber Sale will have "No Effect" upon current steelhead population or habitat status within the Woodtick Creek and Moyer Creek drainages. It is my further determination that Alternatives 2, 4, 5, 6, and 2a of this propose timber sale "May Affect Individuals, but are Not Likely to Result in a Trend Toward Federal Listing" of steelhead. Finally, due to probable and unavoidable sedimentation impacts to the stream substrates of Salt Creek and Moyer Creek receiving waters, it is my determination that Alternative 3 of the proposed Moyer Salt Timber Sale "Is Likely to Result in a Trend Toward Federal Listing" of steelhead trout.

Westslope Cutthroat Trout

Based upon analysis of the effects of the proposed alternatives, and contingent upon implementation of Salmon National Forest soil and water Best Management Practices (BMPs) and site specific soil, water and fisheries mitigations as identified within the FEIS, it is my determination that each of the seven proposed Moyer Salt Timber Sale alternatives would have "No Effect" upon current westslope cutthroat trout habitat status within the Woodtick Creek and Moyer Creek drainages.

Bull Trout

Based upon analysis of the effects of the proposed alternatives, and contingent upon implementation of Salmon National Forest soil and water Best Management Practices (BMPs) and site specific soil, water and fisheries mitigations as identified within the FEIS, it is my determination that Alternative 1 of the proposed Moyer Salt Timber Sale will have "No Effect" upon current bull trout population or habitat status within the Woodtick Creek and Moyer Creek drainages. It is my further determination that Alternatives 2, 4, 5, 6, and 2a of this propose timber sale "May Affect Individuals, but are Not Likely to Result in a Trend Toward Federal Listing" of bull trout. Finally, due to probable and unavoidable sedimentation impacts to the stream substrates of Salt Creek and Moyer Creek receiving waters, it is my determination that Alternative 3 of the proposed Moyer Salt Timber Sale "Is Likely to Result in a Trend Toward Federal Listing" of bull trout.

Management Recommendations

As all soil, water, and fisheries Best Management Practices (BMPs) and mitigations considered necessary to avert adverse impacts to fisheries resources under action alternatives 2, 4, 5, 6, and 2a were incorporated within the original timber sale proposal, no additional measures are recommended for these alternatives. Expected adverse impacts to the Salt Creek stream channel under Alternative 3 are related primarily to a site specific inability to adequately protect the stream from road slope erosion at the proposed crossing location. This alternative additionally suffers from a logistical inability to relocate this route to a location which would avoid the steep, stream parallelling approaches which create such a high risk erosion hazard (see attached memo of February 5, 1993). Potential engineering, soil and water measures not currently included within the mitigation package for this alternative include full bench road construction in the vicinity of the Salt Creek crossing, and silt fence installations below road fill slopes. Application of additional vegetation-based erosion attenuation measures are largely precluded at this proposed crossing, however, due to the harsh environmental growing conditions on the dry, south-facing slopes.

Literature Cited

Allen, K. R. 1969. "Limitations on Production in Salmonid Populations in Streams", In *Symposium on Salmon and Trout in Streams*, T. G. Northcote, ed., pp. 3-18. H. R. MacMillan Lectures in Fisheries. Univ. of British Columbia: Vancouver.

Bjornn, T. C. 1969. *Embryo Survival and Emergence Studies*. Job. No. 5, Federal Aid in Fish and Wildlife Restoration. Job Completion Report., Proj. F-49-R-7. Idaho Fish and Game Dept.: Boise, ID. 11 pp.

Burum, D., M. Sprague, and B. Lewis. 1990. U.S. Forest Service Region 4, Salmon National Forest, GAWS Level I Stream Habitat Inventory. Salmon National Forest Fisheries Files.

Carter, D. 1990. Unpublished baseline aquatic survey data for the Salmon National Forest. Salmon National Forest Fisheries Files.

Chapman, D. W. 1962. "Effects of Logging upon Fish Resources of the West Coast." *J. of Forestry*. 60(8): 533-537.

Chapman, D. W. 1966. "Food and Space as Regulators of Salmonid Populations in Streams." *American Naturalist*. 100: 345-357.

Evans, W. A. and F. B. Johnson. 1980. *Fish Migration and Fish Passage: A Practical Guide to Solving Fish Passage Problems*. U. S. Department of Agriculture Forest Service EM-7100-2, Washington, D. C.

Greene, G. E. 1950. "Land Use and Trout Streams." *J. Soil and Water Conserv.* 5: 125-126.

Idaho Department of Fish and Game. 1965. Inventory of Idaho Streams Containing Anadromous Fish, Including Recommendations for Improving Production of Salmon and Steelhead. U.S. Fish and Wildlife Service, Bureau of Commercial Fisheries, Contract Number 14-19-001-431. June 15, 1965.

Kimble, L. A., and T. A. Wesche. 1975. "Relationship Between Selected Physical Parameters and Benthic Community Structure in a Small Mountain Stream." *Water Resource Research Institute Series*, No. 55. Univ. of Wyoming: Laramie. 64 pp.

Koski, K. V. 1966. "The Survival of Coho Salmon (*Oncoryhnchus kisutch*) from Egg Deposition to Emergence in Three Oregon Coastal Streams." Oreg. State Univ.: Corvallis. 84 pp. (Master's Thesis)

LaFontaine, G. 1981. *Caddisflies*. Lyons and Burford: New York. 336 pp.

Leopold, L., M. G. Wolman and J. P. Miller. 1964. *Fluvial Processes in Geomorphology*. W. H. Freeman Co.: San Francisco, CA. 522 pp.

McNiel, W. J., and W. H. Ahnell. 1964. *Success of Pink Salmon Spawning Relative to Size of Spawning Bed Materials*. U.S. Fish and Wildl. Serv. Spec. Sci. Rep. Fish. No. 469. 15 pp.

Meehan, W. R., F. J. Swanson and J. R. Sedell. 1977. "Influence of Riparian Vegetation on Aquatic Ecosystems with Particular Reference to Salmonid Fishes and their Food Supply." In *Importance, Preservation, and Management of Riparian Habitat: Proceedings of a Symposium; 1977, July 9, Tucson, AZ*. tech. coords. Johnson, R.R. and D.A. Jones, pp. 137-145. Gen. Tech. Rep. RM-43. U.S.

Department of Agriculture, Forest Service, Rocky Mountain Forest and Range Experiment Station: Fort Collins, CO. 1977.

Northwest Power Planning Council. 1991. Salmon River Sub-Basin Salmon and Steelhead Production Plan.

Northwest Power Planning Council. 1991. Chinook Salmon and Steelhead presence/absence files for the Salmon River Subbasin.

Phillips, R. W. 1970. "Effects of Sediment on the Gravel Environment and Fish Production." In *Proceedings of Forest Land Uses and Stream Environments*, pp. 64-75. Oregon State University: Corvallis, Oregon.

Reiser, D. W. 1986. Panther Creek, Idaho, Habitat Rehabilitation - Final Report. BPA Project No. 84-29. Prepared for: U.S. Department of Energy, Bonneville Power Administration. Portland, OR. January, 1986.

Rieffenberger, E. 1992. Personal Communication. Discussions with Robert Rose concerning effects of the Tick Creek Timber Sale upon peak streamflow magnitude and timing in Little Woodtick and Woodtick Creeks.

Rosgen, D. L. 1978. "Prediction Techniques for Potential Changes in Sediment Discharge Due to Silvicultural Activities." ASCE Annual Meeting. Pittsburg, PA. 1978. 12 pp.

Simpson, J. C., and R. L. Wallace. 1982. Fishes of Idaho. University of Idaho Press. Moscow, Idaho.

Smith, B. 1991. Personal Communication. Discussions with Robert Rose concerning the effect of the warming influence of Woodtick Creek on winter anchor ice formation in Panther Creek.

Smith, B. 1993. Personal Communication. Discussions with Robert Rose concerning prioritization of migration barrier repairs on the Salmon National Forest.

Sprules, W. M. 1947. *An Ecological investigation of Stream Insects in Algonquin Park, Ontario*. Univ. Toronto Studies. Biol. 56. Publ. Ont. Fish. Res. Lab. 69: 1-81.

Tambe, C. 1989. Personal Communication. Discussions with Robert Rose concerning the presence of cutthroat trout in the upper reaches of Panther Creek above the USFS Moyer housing site.

Troendle, C. A. 1982. "The Effects of Small Clearcuts on Water Yields from the Deadhorse Watershed; Frasier, Colorado." In *Proceedings of the 50th Annual Meeting of the Western Snow Conference*, (Reno, Nevada; April 19-23, 1982), pp. 75-83. Colorado State University: Fort Collins, Colorado. 225 pp.

Troendle, C.A., and R.M. King. 1985. "The Effect of Timber Harvest on the Fool Creek Watershed, 30 Years Later." Water Resources Research 21, p. 1915-1922.

USDA Forest Service. 1988. Forest Land and Resource Management Plan for the Salmon National Forest.

Wicket, W. P. 1958. "Review of Certain Environmental Factors Affecting the Production of Pink and Chum Salmon." *J. Fish. Res. Bd. Can.* 15(5): 1103-1126.

Yee, C. S., and T. D. Roelofs. 1980. "Planning Forest Roads to Protect Salmonid Habitat." In *Influence of Forest and Range-land Management on Anadromous Fish Habitat in Western North America*. ed., W. Meehan. Pacific Northwest Forest and Range Experiment Station. USDA Forest Service: Portland, Oregon.

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APPENDIX H

BIOLOGICAL DIVERSITY

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LANDSCAPE ECOLOGY: Ecology as It Pertains to Biological Diversity

Introduction

The Salmon National Forest's biological diversity analysis is divided into three levels: the regional level, landscape level, and Forest Level.

Landscape ecology has a close relationship to biological diversity because of its placement in the landscape level of analysis. This large (≈30,000 acres) landscape level appears to be the most promising size for detecting effects on biological diversity and maintaining a sustainable environment (Forman 1990).

This report addresses the landscape level of biological diversity in the Moyer Salt area through a discussion of landscape ecology. It also serves as a reference for information in Chapters I through IV of the EIS.

SECTION I. AFFECTED ENVIRONMENT

I. LANDSCAPE LEVEL

A. Definitions

In this document we will define a landscape as a heterogeneous land area composed of a cluster of interacting ecosystems that are repeated in similar form throughout the geographical landscape (Forman and Godron 1986). A landscape is a distinct, measurable unit and is recognizable by the similarities in its inherent patterns of interacting ecosystems, geomorphology (landforms), and disturbance regimes (Forman and Godron 1986).

The following terms will be used throughout the discussion. For clarity's sake they will be defined here:

Ecosystems - For the purpose of this analysis we will use the term ecosystem to refer to the basic landscape unit. Ecosystems are basic, relatively homogeneous, ecological elements or units of the land whether they are of natural or human origin (Forman and Godron 1986). The three main types of landscape elements or ecosystems we will consider are patches, corridors and matrixes.

Patches - A **patch** is a nonlinear habitat differing in appearance from its surroundings. Patches vary widely in size, shape, type, heterogeneity, and boundary characteristics (Forman and Godron 1986). One example would be a wet meadow surrounded by conifer forest; another would be a forest stand composed of one species and/or age class of tree surrounded by habitat that is different in species composition, age or perhaps density. Closed boundary patches are those whose entire borders lie within the landscape, as opposed to open boundary patches whose borders extend beyond the landscape (Forman and Godron 1986).

Corridors - In simplest terms, **corridors** are comparatively narrow strips of land which differ from the habitats on either side (Forman and Godron, 1986). An example would be a cottonwood tree-lined riparian area in shrub/steppe habitat.

Matrix - The **matrix** is the largest and most connected ecosystem unit, and therefore plays the dominant role in landscape functions such as flows of energy, materials, and species (Forman and Godron 1986). It is either the major type of ecosystem with the most acreage within a landscape, or it has the greatest connectivity, or it exerts the greatest degree of control over landscape dynamics. Examples of matrixes would be coniferous forest, sagebrush flats, or agricultural cropland.

Structure - Each individual ecosystem or element at the landscape scale is either a patch with significant width, a narrow corridor, or the background matrix, itself. These ecosystem elements in turn vary in size, shape, number, type, and configuration. Ecological objects such as animals, plants, biomass, heat energy, water, and minerals/nutrients are distributed among these ecological elements. Determining the spatial distributions of the ecosystems is to understand landscape **structure** (Forman and Godron 1986).

Landscape ecology and its relationships to life processes are not fully understood by ecologists. However, ecologists know that many organisms require more than one ecosystem to complete their life cycles and, therefore, are dependent on landscape mosaics for survival. Harris (1984) has indicated that the landscape mosaic approach is the only one that can ensure: 1) the conservation of known endangered species, 2) ecotypic diversity and allelic polymorphism (variety in the gene pool of a species), 3) a diversity of native vertebrates, 4) community interactions of native large mammals and birds, unknown or unidentified species and processes, and 5) known natural old-growth ecosystem processes.

B. Analysis Landscape

Landscape Boundaries for this Analysis

The boundaries of the Moyer Salt Landscape (see Figure III-2) were delineated on the basis of energy, nutrients flow, species flow, climate and geomorphology. This method was suggested by Harris (1984), Forman and Godron (1986), and Kimmins (1987).

The Moyer Salt Landscape spans approximately 33,000 acres and is bounded on the west by the ridge between Moyer Creek and Panther Creek; on the north by the ridge between Little Wood Tick Creek and Copper Creek; on the east by the main Salmon River Mountain ridge and on the south by the ridge north of Opal Creek.

The landscapes surrounding the Moyer Salt Landscape are predominately mixed conifer ecosystem matrices. Patches of open forest and non-forested areas are present on south and west-facing slopes, particularly at elevations below 7,500 feet.

The Moyer Salt Landscape includes the Moyer Creek and Woodtick Creek drainages and their tributaries. Both creeks are steep and U-shaped at their headwaters, trending towards V-shaped valley bottoms, typical of the Salmon River Mountains. These creeks flow west from the Salmon River Mountain divide to Panther Creek.

A major north/south divide separates the Moyer Salt Landscape from the Iron Lake landscape to the east. East of the divide, water, nutrients and energy flow to the main Salmon River. West of the divide, they flow into Panther Creek.

The matrix for the landscape consists of young (immature) Douglas-fir forest (7,991 acres) with a smaller component of mature Douglas-fir forest (4,614 acres). At elevations below 7500 feet and on north-facing slopes at lower elevations they occur as stringers separating open areas. Three to seven inches DBH mixed conifer forest (5,451 acres) and non-forested areas (5,517 acres) also comprise major portions of the landscape.

Mature mixed conifer-subalpine fir, engelmann spruce or lodgepole mix (2,327 acres), immature mixed conifer (4,909 acres), open forest (4,402 acres) are also present in the landscape. Smaller components of the landscape are mixed conifer seedlings and saplings (303 acres), lodgepole pine immature forest (543 acres) and lodgepole pole-sized (1,151 acres) and Douglas-fir pole-sized (163 acres).

Patches of non-forested or open forested types vary in size from 4 acres to 995 acres with an average size of 107 acres. Typically, the south and west aspects at lower elevations consist of non-forested areas which are usually rocky and support grasses, sedges, sagebrush, shrubs and scattered trees. Habitat types associated with these openings include sagebrush/bluebunch wheatgrass (ARTR/AGSP), big sagebrush/Idaho fescue (ARTR/FEID) and whitebark pine/subalpine fir (PIAL/ABLA) types.

C. Surrounding Landscapes

1. Adjacent Landscapes: conifer forest matrix landscapes

a. Description

The mixed conifer forest landscapes to the north, east, south and west of the Moyer Salt Landscape are similar to each other and to the Moyer Salt Landscape. All of these landscapes are vegetated with Douglas-fir, lodgepole pine and subalpine fir, interspersed with rocky outcroppings and meadows. Non-forested areas of shrubs, forbs and grasses are present particularly at lower elevations and south and west facing slopes.

b. Flow

I. Wind, water, nutrients, energy

Movement of abiotic materials among the four surrounding conifer forest matrix landscapes and the analysis landscape is dependent on the action of air and water currents. The water flow through the Moyer Salt Landscape is predominately westward toward Panther Creek via the Moyer and Woodtick Creeks. Abiotic materials erode and flow readily as suspended sediments from the Moyer Salt Landscape to the west via the Moyer Creek and Woodtick Creek. The prevailing winds are from the north/northwest, however, abiotic material which is suspended in the atmosphere may be moved in any direction by local wind currents.

The predominate wind and water flow occurs between the Moyer Salt Landscape and the Panther Creek Landscape to the west. The Moyer and Woodtick streams flow directly into Panther Creek and through the Panther Creek Landscape. Nutrients in the form of sediment from the Moyer Salt Landscape are transported via creeks to downstream landscapes including the Fawn Creek Landscape to the north. (See Landscape Boundary Map, in Chapter III, Figure III-2).

A limited flow of abiotic materials occurs between the Moyer Salt Landscape and the Iron Lake Landscape to the east. A major hydrologic divide of the Salmon River Mountains separates the landscapes. Wind currents may transport materials across the ridgeline. Water flow east of the ridge in the Iron Lake Landscape flows east via the Forks of Iron Creek and Forks of Hat Creek into the Salmon River.

Some wind flow likely occurs between the Moyer Salt Landscape and the Morgan Creek Landscape to the south across the ridgelines that separate the landscapes.

II. Plants

Plants interchange between the Moyer Salt Landscape and the surrounding landscapes by wind or waterborne seeds; by pollen via insects and birds and by animals who ingest the seeds and later deposit them or transport them in their fur.

Naturally occurring and man-made corridors may facilitate transfer of seeds from one landscape to another. Some species follow ridges, streams and/or roads in their movements.

III. Animals: birds, mammals, invertebrates, reptiles, fish

Most of the birds and animals which occur in the surrounding mixed conifer forest landscapes and the analysis landscape can likely move across both landscapes because the surrounding landscapes are similar to the analysis landscapes.

Non-flying and flying invertebrate species can move easily among the landscapes as habitat allows. Aquatic insect species can move easily between the Moyer Salt Landscape and the Panther Creek landscape to the west and north to the Fawn Creek landscape. High elevation lakes and meadows are found in the eastern portion of the Moyer Salt Landscape and the adjacent Iron Lake Landscape to the east. It is likely that aquatic insect species can interchange between the landscapes.

The benthic macroinvertebrate communities of Woodtick and Goodluck Creeks in the Moyer Salt Landscape are comprised primarily of stonefly and mayfly species, indicating both cold, well oxygenated water of good chemical quality, and clean substrates relatively free of sediment deposition.

Most of the reptiles that occur in the analysis landscape probably move between the Moyer Salt Landscape and the surrounding landscapes by following natural corridors like riparian areas or across land where similar habitats adjoin at the landscape boundary.

Fish move back and forth between the Moyer Salt Landscape and the landscape to the west (Panther Creek landscape) seasonally. A 60 inch culvert in Woodtick Creek currently creates a barrier to fish passage during high water conditions. Exchange of genetic information can occur indirectly between the Moyer Salt Landscape and the landscapes to the north and the south because the streams in all three landscapes flow basically westward and meet in Panther Creek. Genetic interchange is more difficult between the Moyer Salt Landscape and the landscape to the east because a major ridgeline (hydrologic boundary) separates them. However, Panther Creek joins the Salmon River 25 miles downstream of the landscape so genetic interchange is possible. Panther Creek and the Salmon River are free-flowing so they are not barriers to movement.

IV. T&E, Proposed and Sensitive Species

North American Lynx- The lynx is a close relative of the bobcat (same genus) Lynx are well adapted to travel in deep snow (Koehler and Brittell 1990). This is vital to the pursuit of snowshoe hares, their primary prey species. Lynx use mature forest stands for denning, cover for kittens, as well as travel corridors.

Because lynx prey on snowshoe hare, good snowshoe hare habitat is an important element of good lynx habitat. The preferred habitat for lynx is dense lodgepole pine for hunting snowshoe hares coupled with higher elevation spruce-fir forests for denning (Clark et al. 1989). Lynx will usually not cross openings greater than 300 feet. Lynx typically travel along ridges and saddles if mature spruce-fir forest cover is maintained. (Koehler and Brittell 1990)

In the Northern Rocky Mountains, the wolverine prefers mature or intermediate subalpine fir habitat particularly south and easterly slopes and edge and ecotonal areas around cliffs, slides, blowdowns,

basins, swamps and meadows. They are described as scavenging predators, feeding on carrion, fruits, marmots and rodents. Wolverines occur where there are large and diverse ungulate populations.

The **spotted frog** is a highly aquatic species found in the vicinity of cold, permanent water streams, rivers, springs and small lakes of both wood and meadows (Stebbins 1966). The dispersing behavior of the spotted frog is not known. Movement among adjacent landscapes likely occurs along streams or wetlands since spotted frogs' skin needs moisture.

Boreal Owls, northern three-toed woodpeckers, and **great gray owls** move readily in the spruce-fir life zone, their preferred habitats. In addition, great gray owls also move to open forests and natural or man-made openings to forage. The mobility of these birds allows them to move among the landscapes surrounding the Moyer Salt Landscape.

Western Big-eared Bats forage over sagebrush-grasslands, riparian areas, open pine forest, and arid scrub. Little is know about the suitability of or selection for forested habitats. They use rocky outcrops, caves, and old mines for roosting habitat. It is not known whether these bats inhabit the landscape. However, because of their ability to fly they could disperse among landscapes surrounding the Moyer Salt Landscape.

Northern Goshawks require dense mature to old growth conifer, mixed conifer/aspen or aspen stands for nesting in the Rocky Mountain region (Shuster 1980). Goshawks hunt a variety of small mammals and bird in dense forested areas, semi-forested areas, natural openings and over water. Northern goshawks have been observed in the Moyer Salt Landscape.

The Rocky Mountain gray wolf, an endangered species, potentially occurs in the Moyer Salt Landscape and adjacent landscapes. (See Appendix F: Biological Assessments). Wolves have large home ranges (Northern Rocky Mountain Wolf Recovery Plan 1987) and juvenile wolves are known to disperse great distances. Wolves could move easily among all the contiguous landscapes.

c. Corridors

I. Animals: birds, mammals, invertebrates, reptiles, fish

Corridors exist between landscapes and are features or habitats that facilitate or concentrate flows of organisms across landscape boundaries and barrier habitats. For example, topographic or hydrologic features which occur at landscape boundaries provide avenues for animals and plants to disperse.

Thus, features that: 1) funnel or concentrate wind and water currents provide corridors for the flow of birds and insects, airborne seeds and pollen and aquatic species across alien habitats, 2) modify snow deposition patterns allowing animals to cross barrier habitats by providing bridges across water or through forested areas (interception), and 3) change habitat distribution thereby creating a habitat projection into or across a barrier.

Some species may avoid corridors due to concentration of predators in the corridors.

II. T&E, proposed and sensitive species

Wolves, lynx, wolverines, spotted frogs or fish moving between the Moyer Salt Landscape and any of the surrounding mixed conifer landscapes would probably use riparian corridors for movements because these corridors often provide habitat they require. Some prey species use riparian areas in these landscapes for cover and foraging.

Similarly, western big-eared bats, boreal owls, three-toed woodpeckers, great gray owls and northern goshawks may move along them since prey, cover and perches may occur in riparian areas.

Species which fly, have large home ranges, or are habitat generalists (wolves, wolverines, North American lynx, western big-eared bats, three-toed woodpeckers, great gray owls, boreal owls, and northern goshawks) can freely move among the Moyer Salt Landscape and surrounding mixed conifer landscapes.

Wolves are able to travel great distances and utilize a variety of habitats. In short, they are adapted to readily move across landscape boundaries and sub-optimal habitats. Dispersing wolves in the northwest have been known to travel hundreds of miles, crossing many different habitat types and physiographic features (US Fish and Wildlife Service 1992). While these large canids are capable of traveling across unsuitable habitats, mortality increases dramatically where roads occur or in landscapes dominated by human activity (See Appendix F: Biological Assessment for wolves).

Similarly, lynx and wolverine are large predators which cover many habitats in search of prey, although both species are associated with specific habitats. Lynx, in particular, are largely dependent on snowshoe hares (see Appendix G1: Biological Evaluation, "Lynx"). Wolverines are found mainly in remote habitat and lynx are harvested in Idaho as a furbearer. Therefore, high mortality may occur when these species cross landscapes or ecosystems with high road densities.

The movement (or flow) of wolverines is not restricted by rivers, highways, valleys or major mountain ranges (Hornocker and Hash 1980) Wolverines' large feet make them well suited for travel over snow (Hash 1987). Any wolverines in the Moyer-Salt landscape should be able to travel readily between adjacent landscapes.

Western big-eared bats, boreal owls, northern three-toed woodpeckers, great gray owls and northern goshawks probably move independently of habitat corridors at the landscape scale because they are adapted for flight. Although they may utilize corridors for cover when foraging or to avoid predation when moving between larger blocks of suitable habitat. However, all are capable of moving across large areas of unsuitable habitat in search of foraging areas or during migration.

The spotted frog is probably the least able of the non-fish listed species to travel across wide, inhospitable habitats. However, this amphibian crosses disparate habitats seasonally, perhaps by following riparian corridors. Snake River Basin sockeye, chinook and steelhead, westslope cutthroat and bull trout are the listed species most dependent on corridors for movements between ecosystems and landscapes. These fish all require continuous flows of water, and specific (sometimes species-specific) environmental parameters in streams (temperature, turbidity, gradient, etc.) for movements to occur.

III. Plants

One of major corridors for movement of biotic material among the Moyer Salt Landscape and surrounding landscapes are riparian corridors. These dendritic water courses act as corridors in three ways. First, they move water between the landscapes (corridors for aquatic vertebrate and invertebrate species and plant seeds, spores and pollen). Second, they increase the quantity and structure of vegetation bordering the streams which create thermal and hiding cover for terrestrial vertebrate and invertebrate species in which to move. Last, they serve as cold air drainages and act to move plant seed and pollen and invertebrates on wind currents.

Other corridors for movement of biotic material between these landscapes are: roads (such as the Salmon River Mountain Road) and trails (such as the Moyer jeep trail). Roads and trails provide corridors for invading plants and cursorial (running) animals. Prevailing general and local winds help

disperse plant seeds and pollen, invertebrates and birds. Plant seeds are moved indirectly on or in animals as they follow roads or trails or funnel through geographic features.

II. LANDSCAPE ECOSYSTEMS STRUCTURE: PATCHES, CORRIDORS, AND MATRICES

A. PATCH ECOSYSTEMS

We have elected to use habitats, land forms and forest stands identified from forest types maps, aerial photo interpretation, and ground reconnaissance as patches in this analysis of the Moyer Salt Landscape. We have made the assumption that each forest class identified represents a different patch or corridor. Table H-1 displays the total acreages by forest class for the Moyer Salt Landscape. The non-forested acres are represented by overlay codes 40, 60, and 90. These include rock outcrops, lakes, ponds, meadows and shrub/forb vegetation. All other overlay codes represent forest types that vary in size, density and steepness of ground slope.

1. Heterogeneity among patches

Heterogeneity is most strongly reflected among the patches in vegetative cover. High levels of heterogeneity exist among forested and non-forested patches. The heterogeneity lessens when forested patches are compared with other forested patches. In these instances the characteristics that differentiate heterogeneity or that describe a patches' degree of difference to another patch become tree species, size, age and density, edge and understory vegetation, all of which reflect site, slope and aspect.

Heterogeneity among the patches in a landscape is one of the factors that comprises diversity. The spatial relationships of the patches to each other is also important. A landscape containing varied forested and non-forested patches like the Moyer Salt Landscape tends to have greater biological diversity than one in which the patches are similar. According to Harris (1984), "the full spectrum of genetic resources can only be conserved by focusing on the heterogeneous landscape mosaic."

2. Boundary shape

In this analysis landscape, at higher elevations (above 7200 feet) forested ecosystems are nearly continuous with small patches of shrub, forb, grass, rock or water. Below 7200 feet, coniferous forest appears as stringers on the north side of slopes and other moist areas. These stringers have irregular boundaries that follow landforms and moisture patterns. The edges are often not distinct, the density of the forest decreases as it nears the limits of moisture. Boundary shape is important because a convoluted boundary between matrix and patch or between two landscapes tends to promote the interchange or flow of biotic and abiotic materials. The greater interchange results because the boundary is longer in relationship to the area contained (Forman and Godron, 1986).

3. Edge and edge effect

The boundary of an ecosystem or patch is called an edge. Edges often share ecological characteristics of the ecosystems that border them. Edges vary in widths, depending upon vegetation types, ages, and conditions. The effect these edges have upon animals, plants and abiotic materials is called the "edge effect."

Edge and edge effect are directly related to the level of heterogeneity between patches. Generally as the amount of heterogeneity between the two ecological elements increases so does the edge effect. For example, a patch of old growth that is surrounded by mature timber is less distinct and therefore has less edge effect than an old growth patch surrounded by regeneration areas (Harris,

1984). Edge effect is greatest between the forested communities and the non-forested ones. Edge effect is greater between forested stands that differ in species composition than in stands of the same species that differ in structure by one age class.

It has been shown that maintaining the proper ratio and juxtaposition of cover and foraging area is important for producing high quality elk and mule deer habitat (Towry 1984). The edges between forested and non-forested ecosystems in the Moyer Salt Landscape are especially attractive to these large ungulates, concentrating them and the animals that prey on them throughout all but the winter months.

The affinity of some species for the interface between the forested and non-forested ecosystems acts to constrict or funnel movements and flow of other Sensitive Species and their prey, as well. North American lynx benefit from edges in forested ecosystems as the increased shrubby vegetation associated with early seral stages and riparian areas in timber habitat types provides cover and forage for snowshoe hares (see Appendix F: Biological Evaluation, "Lynx"). While great gray owls, boreal owls and northern goshawks often nest in the interior of forested patches, these species are known to forage along the interface of forested/non-forested patches and riparian/forested patches (Spahr et al. 1991; Jones 1979). Similarly, western big-eared bats are known to forage in riparian areas and open meadows.

Three-toed woodpeckers have habitat preferences for the interior of forested patches. However, the occurrence of fire increases the number of snags in timbered patches. As a result, this species is attracted to forested patches that have recently burned, as well.

Lemhi penstemon is often found growing along the edge between forested and non-forested patches. This species occurs where patches are disturbed or where roads are constructed through patches. (see Appendix F: Biological Evaluation)

4. Homogeneity among patches

Fourteen (or 78 percent) of the forest classes in the analysis landscape are forest communities. These stands comprise 73 percent of the analysis landscape acreage. The stands are homogeneous in that they support trees as overstory vegetation with smaller trees, shrubs, grasses and forbs in the understory. The forested ecosystems are comprised of conifers. In general, all of the forest ecosystems have the potential to grow trees up to at least 12 inches in DBH and to provide a minimum of 50 percent vegetative cover in the form of mature trees.

Four (or 22 percent) of the forest classes are non-forest ecosystems but comprise over 27 percent of the landscape acreage. These ecosystems do not support an overstory of trees (or the stocking is very low) and some areas are covered mainly by rock or rock fragments where lichens are the only vegetative cover.

5. Patch disturbance/recovery regimes

Disturbances are events that cause major changes in the normal ecological functioning of the landscape, ecosystem, patch or corridor. These often set back ecological succession to an earlier stage. Disturbance regimes are the recurring patterns of disturbance in a landscape, for example, a pattern of recurring lightning-caused fires or annual floods in a landscape. Recovery regimes are the recurring processes that systems undergo after the disturbance, usually a progression of seral stages which are characteristic for a particular habitat type.

Ecosystems possess particular disturbance/recovery regimes. These patterns of disturbance/recovery can be used to predict how landscapes will recover from disturbance. Understanding the natural regimes is important because it may help us predict the ecosystem's response to man-caused

disturbances, such as timber harvest. We can try to tailor timber harvest areas to replicate natural disturbance/recovery regimes.

In the absence of timber harvest, fire is and has been the most common and severe of the disturbance regimes in the analysis landscape. Forested and non-forested ecosystems respond differently to disturbance agents like fire. While fire may set both types of ecosystems back to the earliest successional stage (bare mineral soil), the grass/forb/shrub habitat types may be reestablished within a relatively short time. However, forested habitat types, in the climax stage take hundreds of years to become reestablished in the analysis area.

Table H-1: FOREST CLASS TOTALS FOR THE MOYER SALT EIS ANALYSIS AREA

Overlay Code	Class Description	Total Acres	Percent of Total
1	DF, moderate slope, mature	3386	9.0
2	DF, moderate slope, immature	6275	16.8
3	DF, steep, mature	1128	3.3
4	DF, steep, immature	1716	4.6
5	DF Poles, moderate slope	163	0.4
14	PP or PP/DF mix, Seedling & Saplings, moderate slope	7	<0.1
17	AF, ES, or LP Mix, moderate slope, mature	2327	6.2
18	AF, ES, or LP Mix, moderate slopes, immature	4909	13.1
19	AF, ES, or LP Mix, Poles, moderate slope	5451	14.6
20	AF, ES, LP mix,Seedlings & Saplings, Mod.slope	303	0.8
22	LP moderate slope, immature	543	1.5
23	LP Poles, moderate slope	1151	3.1
33	Deforested, PP or DF moderate slope	17	<0.1
40	Unproductive (productivity/ potential 20 ft³/ac/yr	4402	11.8
60	Non-forest (less than 16.7% stocking of trees)	5517	14.7
90	Water	7	<0.1
817	Unsuitable for Timber Management, AF, ES, or LP Mix, Mature	35.6	0.1
819	Unsuitable for Timber Management, AF, ES, or LP Mix, Poles	24	<0.1
	TOTALS	**37,433**	**100**

NOTE 1: The total acreage is larger than the 33,000 for the Moyer Salt Landscape because some of the timber types (patches) extend into contiguous landscapes.

Table H-2: Forest Class Category Descriptions

Size	Seedlings Saplings Post and Pole Immature Mature	up to 0.99 inches DBH 1.00" - 2.99"DBH 3.00" - 4.99"DBH 5.00" - 8.99"DBH (5.99"lodgepole) 9.00"+ DBH (7.00" lodgepole)
Species	Douglas-fir Ponderosa Pine Douglas-fir, Ponderosa Pine mix Alpine fir, Englemann spruce, or lodgepole mix Lodgepole	DF PP PP/DF AF, ES, LP mix LP
Slope	Moderate Steep	<60% quartzites, <45% on other soils >60% quartzites, >45% other
Not forested	Unproductive, not capable of growing trees (i.e. rocky escarpments or too dry), shallow soils Unproductive, burned and not yet revegetated Non-forest, some trees but less that 16.7% stocking of them	
Unsuitable	For some reason (i.e., slope steepness, old growth retention, etc.) these areas are not suitable for timber harvesting.	

B. CORRIDOR ECOSYSTEMS

Forman and Godron (1986) identified three types of corridors, line, strip and stream corridors. Depending on the characteristics of the corridor and species considered, corridors can function as travel routes or as barriers to travel, as required habitat or as routes to access required habitats (Harris, 1984).

1. Strip Corridor (riparian buffer strips)

A strip corridor is a comparatively wide band of habitat with a central environment that contains species dependent on interior habitat type. This type of corridor is usually less common than line corridors in a landscape. Types of corridors are scale-dependent and vary with the species considered. The continuous forested ridgelines of the Salmon River Mountains crest may serve as a strip corridor for some species. As an example, several listed species are wide-ranging animals (wolves, wolverine and lynx) which have large home ranges and could use this corridor for dispersal and to access different landscapes.

Similarly, corridor function can change seasonally for some species.

2. Line Corridors (roads)

A line corridor is narrower than a strip corridor, and differs in its absence of interior habitat. It is dominated by edge species. Roads, trails and some of the stringers of forested ridges which intrude, finger-like, into shrub/forb ecosystems at lower elevations in the analysis landscape are examples of line corridors.

Approximately 50 miles of road corridors currently exist in the landscape. These range from jeep trails to well-maintained, Forest two-lane gravel roads. They provide motorized access to the lower, middle and upper slope areas in the landscape. Low-standard roads are not maintained for travel purposes and can be difficult to drive. Even roads that are difficult to drive can be used for travel routes by ATVs, horses, and foot travel. Some wildlife species may use these routes for travel.

3. Stream corridors

Stream corridors border water courses and vary in width according to the size of the stream (Forman and Godron, 1986). They control water and mineral nutrient runoff, reducing siltation. A wide stream corridor may also serve as a strip corridor for some species.

The predominant wetlands in the area are riparian spruce wetlands. These wetlands are found adjacent to Woodtick Creek and its tributaries. This wetland type is characterized by an Engelmann spruce (Picea engelmannii) overstory. Aspen (Populus tremuloides), alder (Alnus incana) and/or (A.sinuata) and water birch (Betula occidentalis) may be present. The understory often includes red osier dogwood (Cornus stolonifera), Woods rose (Rosa woodsii), elderberry (Sambucus canadensis), gooseberry (Ribes inerme) and thimbleberry (Rubus parviflora).

Several stream corridors exist in the analysis area. Valleys are steep and U-shaped at their headwaters, trending towards V-shaped valley bottoms, typical of the Salmon River Mountains.

Approximately 30 miles (Salt, Perm and South portion of Woodtick drainages) of riparian corridors exist. Small, high elevation ponds and wet meadows drain into dendritic streams. These corridors provide travel and migration routes through a wide range of ecosystems for some species.

a. Nodes

Nodes (where corridors widen), narrows (where corridors constrict) and the intersection of two or more corridors are places of special ecological importance. These sites act as funnels or collection places for animals and plants and thus collection places for nutrients and energy. When the corridors involved are riparian corridors, their importance is increased both because of the presence of water in an arid environment and because these corridors are connected with other riparian corridors.

Nodes in corridors occur in the analysis landscape where streams join, where forested corridors meet, and where meadows intersect.

b. Heterogeneity

Corridors in the Moyer Salt Landscape are homogeneous in habitat over much of their length. However, some corridors do change with elevation and aspect. This heterogeneity is obvious in the analysis landscape where forested corridors change with aspect from Douglas-fir dominated to subalpine fir dominated communities. Large patches of shrubs and forbs are often found on south or west facing slopes, at lower elevation. Smaller patches are found at higher elevations.

c. Disturbance/recovery regimes

Disturbance and recovery regimes in all three types of corridors in the analysis landscape are related to fire, water, insects and drought. Prior to 1900, fire played the most significant role in modifying habitat in corridors in the Moyer Salt Landscape.

Fire history is poorly understood in these types (Bradley, Fischer, Noste, 1992). Usually, fire is a less frequent disturbance on moist or wet sites than in the rest of the landscape. Fires may be more severe in effect, because of a higher density of vegetation and because rhizomes and seeds of undergrowth that grow in the organic layer of soil may be consumed. At higher elevations, slower decomposition rates, increase the down-fuel loading. Low smoldering fires are most common in wet areas. This removes small groups of trees rather than an entire stand or drainage in these wet communities.

d. Aquatic Habitats for TE&S fish species

The highly migratory nature of anadromous fish species, like the chinook salmon requires uninterrupted aquatic travel routes between freshwater spawning and rearing habitats and oceanic feeding grounds used during most of the adult life of the fish. These routes must be available throughout the period of juvenile out-migration, and once again throughout the period of adult migration to inland spawning reaches.

General habitat requirements vary by life stage, with clean gravel substrates and water temperatures of 40-55 degrees F required for successful spawning, and clear, cool streams with good cover provided by vegetation, organic debris, or boulders are required for successful juvenile chinook salmon rearing (USDA Forest Service 1991)

Bull trout and Westslope cutthroat trout require cool, clear, well-oxygenated streams, and prefer slow water pool habitats. Both species may spend their entire lives in cold headwater areas, or they may migrate to more productive feeding waters of larger streams or lakes and tributary or headwater spawning areas within smaller streams. These journeys require full passage capabilites between adult and spawning/rearing areas during the periods when these migrations occur.

C. MATRIX ECOSYSTEM

The Moyer Salt Landscape conifer matrix consists of 73 percent forested and 27 percent non-forested habitats. This matrix is characterized by conifer stands composed of different tree species and of trees of different sizes and age classes. Some of the forested ecosystems in the analysis landscape are predominated by one age class while others are multi-aged. Douglas-fir forest and mixed conifer forests each comprise approximately 1/3 of the landscape. Patch sizes range from 8 acres to 1093 acres for Douglas-fir and 7 acres to 2,545 acres for mixed conifer. Pure lodgepole pine stands comprise about 5 percent or 1700 acres of the landscape. The remainder of the landscape consists of shrubs and forbs, sometimes with scattered trees, rock outcrops and wetlands.

Many of the forested ecosystems have more than one tree species represented in the stand. In addition to conifer trees, a variety of shrub and non-woody plant species are present in the conifer forested matrix. (For a description of habitat types see chapter 3-16 in the main document.)

The conifer forest matrix is the predominant ecological influence in the landscape. The presence of Douglas-fir forest and mixed conifer forest varies with elevation and aspect, with most of the Douglas-fir type occurring at the lower elevations (below 7,500 feet) on the west 1/2 of the landscape. These patches are usually found on southern and westerly aspects. They are also found on northerly aspects at lower elevations.

The upper slopes and northerly aspects support a lodgepole pine community comprised of lodgepole pine stands and mixed conifer stands of lodgepole pine, Engelmann spruce and subalpine fir. Relatively pure stands of subalpine fir or Engelmann spruce are present along stream bottoms and in wet basins interspersed with small wet meadows.

Whitebark pine and subalpine fir grow on high elevation ridges.

III. PATCH AND CORRIDOR FUNCTION WITHIN THE LANDSCAPE

Forman and Godron (1986) have defined function as "the interaction among spatial elements, that is, the flow of energy, materials, and species among the component elements... Determining and predicting these flows or interactions among landscape elements (ecosystems) is understanding landscape function."

A. ECOSYSTEM CONNECTIVENESS

Connectivity is a measure of how spatially continuous a corridor or matrix is (Forman and Godron 1986). Since the presence or absence of breaks in a corridor is considered the most important factor in determining the effectiveness of both conduit and barrier functions, connectivity is the primary measure of corridor function (Merriam, 1984; Baudry, 1984; Forman and Godron 1986). When connectivity occurs as an intersecting or thin, elongated strip, the elements may function as a series of corridors facilitating both migration and gene exchange among species. However, a high level of connectivity in a landscape corridor has several consequences since elements may function as either physical barriers, separating other elements, or as conduits linking elements depending on the species considered. For instance, a riparian area can act as either an effective physical and biological barrier or as a conduit between two landscape elements.

In some cases, an element may encircle other landscape elements and create isolated biological "islands" which are genetically isolated from other populations of independent species. Thus, within the same landscape, populations of mice, butterflies, and clover may be genetically isolated if separated by barrier elements (Forman and Godron, 1986).

B. POROSITY OF ECOSYSTEMS

Porosity is a measure of the density of patches in a landscape, regardless of patch size (Forman and Godron 1986). It is measured by counting the number of patches with closed boundaries that lie within the landscape. The greater the number of closed patches, the greater the porosity.

Porosity is linked to the genetic variability and isolation of some species present in the landscape, and as such it provides a basis for determining the threat to biodiversity when considering ecosystem modifications like timber sales or fires. The existing porosity within the Moyer Salt Landscape is 208 forested patches and 228 non-forested patches for a total of 436 patches in the landscape.

Porosity and genetic variability

Since porosity is an overall indicator of the degree of species isolation and, therefore, of the potential genetic variability present within populations of animals and plants in a landscape. it can serve as an comparative indicator of biological diversity (Forman and Godron 1986).

Edge effect and porosity

Landscape porosity is related to foraging for some species, since the density and arrangement of suitable patches is an important component of habitat quality (Forman and Godron 1986).

Porosity is also an index of the amount of edge (and thus the edge effect) present in a landscape. Edge width is related to several factors including local wind patterns, sun penetration and differences in the structure of the patches or the patch and the surrounding matrix concerned (Forman and Godron 1986). Edge length and width are factors that have many implications for wildlife management (Leopold 1933). Edges often have a different complement of species inhabiting them and the abundance of individuals in an edge is often different than found in the interior of either adjoining patch. Sometimes edge species replace interior species when the interior of patches are modified and the effective edge between the two patches is increased or a new edge is created. This change in habitat can lead to an increase in predation on interior species by edge predators and an increase in interspecific competition (Wilcox 1985).

The edge portion of a landscape element function could be compared to that of a semi-permeable membrane, filtering the flows in and out of the element. Although the edge effect refers to the structural characteristics of the edge, particularly the organisms, this effect refers to how the edge affects flow. Flows may be described as movement across the edge, such as drifting snow or sand being intercepted by the dense vegetation of a woods border, or as movements along the edge, such as herbivores and predators using the edge as a conduit (Forman and Godron, 1986). Generally there is more of an edge effect between forested and non-forested communities than between different forested communities, because the heterogeneity between these patches is great.

Many species of flying vertebrates (birds and mammals) and invertebrates follow the edges of patches when they move across the landscape. In addition, many species follow corridor edges when moving across or around patches that lack structural diversity (shrub/grassland habitat). Therefore, edges of patches that border meadows, riparian corridors and timber stringers are of particular importance as travel ways for many species.

Conversely, low porosity sometimes indicates the presence of remote habitat in a landscape, a condition that is important for species which require habitat distant from boundaries (Forman and Godron 1986, p. 170). An example would be interior old-growth dependent species.

In addition, the edge between forested and non-forested ecosystems affects the non-forested patch by altering the evaporation rates and surface wind speeds. Hedgerow studies indicate that evaporation could be reduced for a distance of up to 16 times the height of the edge forest. Also, the studies show that wind speeds could be reduced for distances of up to 28 times the height of the forested edge (Forman and Godron 1986).

C. T&E, P, AND S Species and Porosity/Connectivity

No TEPS animal species are known to be indigenous only to the Moyer Salt Landscape. This means that of the known animals and plants that occur in the landscape all are genetically connected with conspecific populations in other landscapes. Therefore, we can conclude that resident species are adapted to the current level of porosity and connectivity in the landscape. Since the Moyer Salt Landscape is composed of 436 patches with a mean size of 86 acres. Since habitat "perception" is scale-related, it is not surprising that higher order animals which have relatively large home ranges have remained genetically linked to populations in other landscapes. However, the distribution and taxonomy of plants in east central Idaho has not been thoroughly investigated and very little is known about invertebrates that occur there. Some endemic species of invertebrates and varieties of plants in the analysis landscape may have become reproductively isolated some time in the past and are now genetically distinct.

All but one of the T&E, P and S animal species which could potentially occur in the Moyer Salt Landscape are either species with large home ranges or flying species which can cross or frequent

various habitats. The exception is the spotted frog. A survey of spotted frogs has not been conducted on the Salmon National Forest, and we do not know if this species occurs in the analysis landscape. There are no obvious barriers to spotted frogs in the Moyer Salt Landscape. Spotted frogs can move between patches of appropriate habitat and along riparian and timber corridors. Spotted frogs have been found at various locations throughout the forest, therefore, we can assume that spotted frogs have the ability to colonize and maintain genetic connections in habitat patches which are geographically separated.

The only T, E, P or S plant species thought to occur in the Moyer Salt Landscape is Lemhi penstemon. This plant has a simple dispersal: the capsules open and the seeds fall out and take root near the plant. Apparently, seeds of this plant are not transported by animals or wind. This type of dispersion requires that appropriate growing habitats be connected so that individuals can colonize habitats in successive steps. Lemhi penstemon is found in a variety of habitats from open-forested patches to shrub/steppe habitat. This habitat tolerance allows the plant to move from landscape to landscape by way of appropriate habitat patches.

Many species cannot survive in one ecosystem and must cross ecosystem boundaries to obtain food, water and/or shelter. Landscape heterogeneity is the fundamental cause of species movement. Observations predict that topographic, vegetational, and soil heterogeneity determine most of the movement patterns of large animals (Forman and Godron 1986). Many species will avoid passing through certain ecosystems that place their life at risk due to exposure or predation (Forman and Godron 1986). The following is a list of T&E, P, and S species and the community types they are thought to avoid or select. Where habitat preferences are not known, a blank space appears. Information is based on the biological evaluations and assessments in Appendix E and on Harris (1984), Spahr et al. (1991), and Hornocker and Hash (1981).

Table H-3: TEPS Select/Avoidance Communities

COMMUNITY	Wolf	Lynx	Wolverine	Goshawk	Boreal owl	G.Gray owl	B.E Bat	Three-toed Woodpecker	Spotted Frog
DF Mature		Select	Select	Select	Select	Select	Select		
DF Immature									
AF/ES/LP, Mature		Select	Select	Select	Select	Select	Select	Select	
AF/ES/LP, Imm.									
AF/ES/LP, Regen/ sapling		Select							Avoid
LP Mature			Select	Select		Select		Select	
LP Immature									
LP Regen./sapl.		Select						Avoid	
Rock, No Veg.	Avoid			Avoid	Avoid	Avoid	Avoid	Avoid	Avoid
Shrub/ steppe	Select	Avoid			Avoid		Select	Avoid	
Riparian Area	Select	Select		Select			Select		Select
Clearcut		Avoid	Avoid	Avoid	Avoid	Select		Avoid	

Avoid = Species is suspected to avoid this community on the basis of available literature. However, for most of these species this community is not a barrier to travel if the patch is small enough.
Select = species is reported to occupy this habitat at least part of the year.

D. FLOW

1. Plants and animals

Animals and plants cross landscapes by moving along routes that are regular and that are determined by natural disturbance, soil type, ecosite features, and human influence (Forman and Godron, 1986).

Species with specific environmental requirements not generally present in the landscape use "rest stops" and "stepping stones" to cross landscapes. Ecosystems that possess the necessary environmental requirements for a species and which become its preferred habitat are those that are located close enough to one another or contain adequate rest stops so that the organism can successfully travel from one location to another. For example, Findley and Anderson (1956) discovered that the existence of riparian forests which could be used as dispersal corridors was critical to the distribution of many species.

The maximum distance between stepping stones is specific to particular organisms. For instance, wolves can travel much greater distances than voles between rest stops or stepping stones. Harris

(1984) has indicated that when addressing movement of a particular species within and across landscapes, four factors should be considered: 1) the linear distance between acceptable habitats, 2) requirements related to sedentary versus migratory species, 3) habitat specificity (how specific the species' habitat requirements are), and 4) tolerance for variation in its habitat. The combined effects of these factors seem to operate most significantly on amphibians and reptiles, followed by mammals, permanent resident birds, and migratory birds (Harris, 1984).

Interior birds and small mammals may not be able to use or cross some corridors due to the width of the corridor. For example, riparian corridors may be too narrow for some birds to nest in, but they could use them for travel. On the other hand, large streams may act as a travel barrier for small mammals and non-flying invertebrates. In some cases small mammals and non-flying invertebrates, may find bridges to be corridors or barriers. Similarly, fallen trees across streams, roads with culverts or with bridges facilitate barrier crossings.

Findley and Anderson (1956) found that the distribution of mammal species in the Colorado Rockies was inversely proportional to their dependence on forests. For example, species which depend exclusively on old-growth are distributed over a smaller range than habitat generalists. Examples of each from the analysis landscape are the goshawk, which requires mature/old growth forest for nesting, and the black bear, whose habitat spans many diverse habitats (Spahr et al. 1991; Towry 1984).

Distribution of plant species is dependent on long and short distance plant dispersal and is considered a part of landscape function. Forman and Godron (1986) stated that, no matter what the dispersal mechanism or distance traveled, three general types of plant movement appear to occur: short-term environmental fluctuations, long-term changes, and new species introductions.

Short-term - Distribution boundaries of plant species fluctuate with short-term, usually cyclic environmental changes. This type of dispersal occurs with annual plants Moyer Salt Landscape.

Some plant species are introduced in new areas and spread widely. This type of movement is evidenced by the recent invasion into the Moyer Salt Landscape by several weed species like spotted knapweed (*Centaurea maculosa*) and cheatgrass (*Bromus tectorum*).

Long-term - environmental changes cause species extinction, adaptation or relocation.

a. Airborne flows

Airborne flows across boundaries occur when flying vertebrates and invertebrates and plants which produce wind dispersed pollen or seeds all move from patch to patch and landscape to landscape. Examples in the analysis landscape include: goshawks, western big-eared bats, boreal owls, three-toed woodpecker, great gray owls, sagebrush (*Artemesia* spp.) and bull thistle *Cirsium vulgare*. In addition, several plants in the analysis landscape depend on birds, mammals, and insects to pick up seeds and pollen and transport them across patches. Examples include: Clark's nutcrackers (*Nucifrage columbiana*), which strip seeds from whitebark pine (*Pinus albicaulis*) cones and then inadvertently plant them when the birds make seed caches in other patches (Hutchins and Lanner 1982); furbearers or humans which pick up beggar ticks (*Bidens cernua*) in their fur or clothing and carry them across patch boundaries; bear or foxes which eat rose (*Rosa woodsii*) hips and carry them to other patches; and when pollen is picked up on the pelage (fur) of animals or the bodies of cursorial insects and carried across patch boundaries.

b. Overland flows

Overland flows between patches and landscapes in the analysis area occur when cursorial (adapted for running) and fossorial (adapted for burrowing) animals move across habitat boundaries. Generally, the patch boundaries within the Moyer Salt Landscape are not barriers to large terrestrial species since most have large habitat home ranges or are generalists.

As with vertebrates, overland flows occur when invertebrates move across patch boundaries, either over or under ground. Invertebrates are the most numerous animals in the Moyer Salt Landscape and the least understood. No baseline data on invertebrate populations or species occurrence have been collected in the analysis landscape. We do not know which species find patch boundaries to be barriers.

Examples of overland flow of invertebrates and plants are: furbearers or humans who pick up beggar ticks (Bidens cernua) in their fur or clothing and carry them across patch boundaries; bears or foxes who eat rose (Rosa woodsii) hips and carry seeds to other patches; and pollen, picked up on the fur of animals or the bodies of insect and carried across patch boundaries.

Overland flows of TEPS species occur when cursorial animals like wolves, wolverines and lynx move from one patch to another. Considering the home range and movement patterns of these species and the small size of most of the patches in the Moyer Salt Landscape, it is doubtful that any of the patch boundaries act as barriers to these species. Spotted frogs are reported to move overland seasonally and may cross some patch boundaries during this time (see Appendix G: BE "Spotted Frog:").

2. Energy

Energy, nutrients, and most species move from one ecosystem element to another in a landscape; none is static. Much of the energy flows and movements of a landscape follow dendritic patterns as does water in landscapes with steep terrain. Harris (1984) states:

> "Although greater amounts of potential energy may be associated with high elevation upland systems, this energy is generally more diffuse and less utilizable. The generally more usable forms of energy occur in the concentrated pathways (streams and riparian strips) and/or lower-elevation floodplain sites. These sites will manifest higher primary and secondary productivity and will support higher densities of wildlife. Since the energy sources are diverse .... , the food web will be correspondingly complex. Because of the diversity and productivity of the food chains, the ratio of carnivores to herbivores will generally increase ...."

In addition, young forests may be an energy source and old forests may be a nutrient and energy sink (as in the case of a carbon sink). Edge may also be a sink for water and snow melt.

The goshawk finds much of its food in open forested areas or meadows. Therefore, these vegetative communities are the energy and nutrients source while the older forest communities which serve as nesting and rearing areas are the sink.

Fish have source/sink relationships to their ecosystems also and by feeding in some areas and resting in others.

One example of how the source/sink function effects plants is in the role of effective precipitation. Edges between densely forested and lightly or non-forested patches are known for heavy snow accumulation. These areas of additional snow can result in more usable water for plants and as other environmental modifications, such as cooler average temperatures, delays of early plant budding, and early frost damage to plants.

Vector of energy flow:

Wind, surface water and subsurface water flows are all vectors for the movement of energy and contribute greatly to ecosystems and landscape function.

> **Wind** flows are very important in the process of snow drifting, seed and pollen dissemination, cold and warm air drainage, fire spread patterns and the movement of insects and disease.
>
> **Water** flows and their relationship to landscape ecology are not yet fully understood, but are known to be very important. Some functions include: transfer of nutrients and soil, water for plant and animals, barriers to animal and plant movement and barriers to disturbance agents like fire.

E. RESISTANCE TO FLOW

Landscape resistance addresses the ease with which wind, water, plants and animals move across ecosystem boundaries. Forman and Godron (1986) state that **boundary crossing frequency** is a general, easily measured indicator of landscape resistance.

> **Boundary crossing frequency** is a measure of the number of boundaries per unit of length that an object crosses in moving across a landscape (Forman and Godron 1986). For example, a deer may begin at one side of the landscape in a heavily-forested old-growth patch, then move to a younger tree patch, then to an open meadow. In the process, it would cross boundaries separating the old-growth from the younger tree patches and then the younger tree patch from the meadow. In this situation, the deer would move easier betweem the forested patches than from the forest to the meadow. According to Forman and Godron (1986), an animal that encounters more similar patches has a lower boundary crossing frequency and therefore may move rapidly across the area.
>
> In determining boundary crossing frequency, it may be helpful to consider boundary discreteness in the calculations (Forman and Godron, 1986, pg. 405). A boundary would be considered highly discrete if it were abrupt, as between forested and non-forested ecosystems. Conversely, a boundary would be considered not very discrete if it were between old growth and mature forest ecosystems.
>
> It is not practical to calculate boundary crossing frequency for all species. We have used the following approach to provide a general idea for the rate of flow of materials and animals across the landscape:
>
> To estimate boundary crossing frequency we counted the number of patch boundaries encountered on the 400-foot topographic lines from one side of the landscape to the other (Table H-4). Patches were defined by forest class codes as either forested or non-forested. Boundaries crossed were categorized as either: forested to forested, forested to non-forested, or non-forested to non-forested.

Table H-4. Boundary Crossing Frequency

	ELEVATION	TYPE	#
	6800	F/F	52
	6800	F/N	61
	6800	N/N	14
TOTAL			127
	7200	F/F	63
	7200	F/N	59
	7200	N/N	7
TOTAL			129
	7600	F/F	76
	7600	F/N	43
	7600	N/N	1
TOTAL			130
	8000	F/F	47
	8000	F/N	42
	8000	N/N	2
TOTAL			91
	8400	F/F	19
	8400	F/N	68
	8400	N/N	1
TOTAL			88

Several conclusions can be drawn from the boundary crossing data:

1. The existing landscape does not have very large continuous patches (tens of thousands of acres) of any one ecosystem type.

2. The landscape relatively patchy, as indicated by the number of boundaries.

3. The landscape is relatively diverse, as indicated by the mix of boundary types (Forested/Forested, Forested/Non-forested and Non-Forested/Non-forested).

After considering the patch structure, patch location, patch shape and other landscape information considered above, the following conclusions were drawn.

1. No patch is totally connected to another patch. Patches 14 (PP or PP/DF mix, seedlings and saplings), 33 (deforested), 90 (water), and 817 (unsuitable, AF, ES, or LP mix, Sawtimber, mature) were represented by only one patch each, which represented less than one percent of the landscape acreage.

2. The non-forest patches represent approximately 12 percent of the landscape and have a relatively high degree of connectiveness partic[illegible]rly at lower elevations. The open forested ecosystems represent approximately 14 percent of the landscape and also have a relatively high degree of connectiveness in their current condition.

3. Non-forested and open forested communities (code 40) account for 26 percent of the landscape area. These areas are represented at all elevation positions in the landscape.

4. Of the forested patches, codes 17 (six percent), 18 (thirteen percent), and 19 (15 percent) are moderate to highly connective, but are found predominately at elevations above 7,000 feet in the landscape. The other forested ecosystems in this landscape have relatively low connectiveness and are relatively isolated.

SECTION II. EFFECTS ANALYSIS OF PROPOSED ALTERNATIVES

I. LANDSCAPE

A. SURROUNDING LANDSCAPES

1. Adjacent landscapes: Conifer forest matrix

a. Heterogeneity and homogeneity: to the Moyer Salt Landscape

Landscape porosity would increase by 0.9 to 2.6 percent of the landscape (depending on the alternative selected) with the addition of 292 to 847 acres of openings. This shift to early successional stages would reduce the average age of trees in the landscape. A shift from environmental openings to human-caused openings would occur. Up to 17.8 miles of new roads would be constructed, providing corridors that facilitate human access despite road closures.

These actions would cause the Moyer landscape to become more similar (homogeneous) to the Fawn Creek, Iron Lake and Morgan Creek landscape and less similar to the Panther Creek landscape.

b. Movement among the landscapes

I. Flow

(a) Wind, water, nutrients, energy.

All of the proposed action alternatives will likely increase water and nutrient flow to downstream landscapes beginning with the Panther Landscape, directly west of the Moyer Salt Landscape. Clearcutting and shelterwood cutting on 292 to 847 acres or 0.9- 2.6 percent of the landscape will increase subsurface and/or surface water flow because there are fewer trees to take up the water. The excess water is either taken up by downhill trees which may allow them to grow faster or it will result in higher flows or longer flows of water in Salt Creek, Woodtick Creek and Moyer Creek, which flow into Panther Creek.

Some nutrients will flow downhill from the newly created roads and openings, via surface water flow.

Timber harvesting can cause an increase in the total water produced by a drainage. Non-forested areas can accumulate more snowpack than adjacent forested lands because of the reduced snow interception by tree cover and by redistribution of snow during storms. Also the transpiration rate is decreased when trees are removed.

The increase in non-forested or lightly forested areas generated by clearcutting and shelterwood cutting ranges from 292 acres to 847 acres or 0.9 percent to 2.6 percent of the landscape, depending on the alternative. The preferred alternative is 815 acres or 2 percent of the Moyer Salt Landscape.

The amount of increase in water and nutrient flow is difficult to measure because of natural variability in water flow. Generally, a significant change in water flow does not occur until 20-30 percent of the watershed is affected (Troendle and Leaf, 1980) [Refer to the Hydrology Effects section (Chapter IV) for further information.]

Of the three watersheds that would be affected by logging, Woodtick Creek would have a maximum of 8.2 percent disturbance; Salt Creek, 14.3 percent ; and "Perm" Creek, 14.2 percent. All of these are below the 20 percent threshold for significant effects to water yield. See Table IV-2 for the percent of affected land by watershed by alternative.

(b) Plants in general

The flow of plants between the Moyer Salt Lnadscape and the surrounding landscapes would not be effected by any of the proposed alternatives. However, as a result of the construction of up to 17.8 miles of new road and the reconstruction of up to 9.3 miles in the Moyer Salt Landscape could create new corridors that could facilitate the movement of plant species, including invasion of exotic plant species, particularly knapweed. Knapweed is known to be spread by motorized vehicles and so could enter the landscape along roads from the north.

In all alternatives chemical herbicides will be sprayed along roads annually as needed to control noxious weeds.

(c) Animals: birds, mammals, reptiles, fish, invertebrates

The flow of animals between the Moyer Salt Landscape landscape and the surrounding landscapes may be altered by this project. Up to 17.8 miles of new travel corridors will be created, facilitating the movement of some species including humans. Slash will be placed on some of the roads (extending from cutbank to fill slope). This will discourage travel by humans on foot and on horseback. Openings will be left to allow travel perpendicular to the road (including humans). They may serve as a filter for some species.

(d) T&E, Proposed and Sensitive species

TEP&S species are the species that are probably the most sensitive to landscape alterations in the Moyer Salt Landscape because of their limited populations. Proposed alterations of the landscape could improve habitat, not effect habitat or degrade habitat for a particular species depending on the scale and level of disturbance of the alteration. Alterations could be beneficial for some TEP&S species and not beneficial for other TEP&S species. The following discussion of the effects of the proposed alternatives is provided to analyze the effects of the alternatives on potential habitat for these species.

American Lynx

New openings created will provide an additional 292 to 847 acres of new browse for snowshoe hare, the main food source for American Lynx. The potential travel routes of lynx may be altered because lynx follow ridges and saddles when mature timber is present and will usually not cross openings of greater than 300 feet (Koehler and Brittell 1990).

All of the openings proposed in all the action alternatives are larger than 300 feet across. The number of openings ranges from 7 to 32 depending on the alternatives. These clearcut areas may be avoided by lynx. Suitable travel corridors are likely available in the landscape.

Wolverine

Wolverine depend on large, diverse ungulate populations, also feeding on fruits, marmots and rodents. Wolverines depend on mature or intermediate subalpine fir habitat, particularly south and easterly slopes and edge ecotonal areas around cliffs, slides, blowdowns, basins, swamps and meadows.

Wolverines have been known to cross clearcut areas but seem reluctant to do so, based on tracks that showed they ran or loped through openings in a straight line as opposed to their normal meandering movement (Hornocker and Hash, 1980).

New roads through the area would be closed to motorized use after five years of the completion of the timber sale. This would limit the access of humans, the only known predator of the wolverine. Some human access may occur on foot or horseback on roads that are not covered with slashpiles.

However, the large home range of wolverines (up to 150 sq. miles), the low population densities and non-selective feeding nature make it fairly unsusceptible to site-specific disturbances, such as timber sales.

Gray wolves

Under each action alternative (except Alternative 5 (helicopter)) the proposed new roads, which would be closed after harvest, would provide a new travel route form the Moyer Salt Landscape to the adjoining landscape to the north for cursorial mammals such as wolves. The alternatives which leave the greatest miles of unrestricted travel routes (some roads will be blocked by piles of slash) would have the greatest effect on potential flow of cursorial mammals.

As a result of restricting vehicle access on all proposed newly constructed roads and restricting human travel via foot or horseback by piling debris on portions of newly constructed roads, human access and presence, after completion of proposed sale activities, should not be appreciably different (i.e. more) than the existing condition.

Spotted Frogs

Spotted frogs are an aquatic species. They likely follow stream corridors. Woodtick Creek is the only creek in the analysis area that is likely to provide habitat for them. One culvert is proposed in Woodtick Creek. It is an open-bottom culvert (similar to a small bridge that leaves the stream bottom intact. This will likely not affect the passage of spotted frogs.

No proposed cutting units are within 0.3 miles of Woodtick Creek, and most are further than 0.5 miles of it. This is far enough from the creek that there should not be an increase in water temperature since trees which provide shade for the stream will remain.

Potential increase in seasonal water flow caused by fewer trees may be beneficial to spotted frog habitat by maintaining cooler water temperatures preferred by spotted frogs.

Birds

Boreal owls, northern three-toed woodpeckers, and great gray owls move readily in the spruce fir life zones. All of these species may use newly created opening for foraging. The openings will provide edge habitat and preferred feeding sites.

II. Corridors of adjacent landscapes

a. Wind, water, nutrients and energy.

Localized wind patterns will change as a result of new openings but prevailing winds will remain the same. The openings provide few, if any trees to slow down the wind.

Stream flow from the Moyer Salt Landscape to the Panther Landscape will continue uninterrupted.

Energy in the form of biomass will be reduced until vegetation is reestablished in the openings. This will occur within 5-10 years after disturbance events.

Soil disturbance associated with timber harvest and road construction can also cause accelerated soil erosion. Generally, accelerated erosion rates are highest immediately following disturbance. The erosion rates of road fill slopes will generally return to normal levels within 2-3 years. Revegetation of road cut slopes may take much longer. Road cut slopes may not revegetate completely because of lack of topsoil, steepness of slopes, or high percentage of bedrock.

Mitigation measures listed in Chapter 2 should limit the amount of erosion. Some erosion will likely continue to occur and some nutrients may flow out of the landscape, westward into the Panther landscape and beyond via Panther Creek.

b. Plants in general

Newly created road corridors would increase potential access for plant seeds. Plant seeds can be transported by motorized vehicles, by animals, some of which may utilize new corridors that facilitate travel, by wind dispersion and water dispersion.

The introduction of exotic plants would occur. In all action alternatives exotic plants found along roads will be treated with herbicides. (see Table II.8 for approximate acreages to be treated for noxious plants).

c. Animals: birds, mammals, reptiles, fish, and invertebrates.

Newly created road corridors would facilitate movement of some species along them and create localized barriers to other species that have difficulty crossing them. The 14.6 to 17.8 miles of new road will facilitate human access even if roads are closed. In alternatives 2, 2A, 4 and 6, approximately 6.5 miles of roads will be covered with slash piles to discourage human access. For a listing of road miles by alternative, see Table H - 10.

Moyer Creek, Woodtick Creek, Salt Creek and other smaller creeks will continue to provide corridors for aquatic species. Genetic interchange among fish in the Moyer Salt Landscape can take place. The Panther Creek corridor links the Moyer Salt Landscape with the Fawn Creek and Morgan Creek landscapes. The Salmon River links Moyer Salt Landscape aquatically with the Iron Lake landscape.

d. T&E, Proposed and Sensitive species

See the above discussion under **Movement among the Landscapes**.

II. LANDSCAPE ECOSYSTEMS STRUCTURE: PATCHES, CORRIDORS, AND MATRIX

A. PATCH ECOSYSTEMS

1. Patches in the analysis landscape

Proposed human-made openings for all alternatives range from 4 to 95 acres. Of the 18 ecosystem types represented in the project landscape, openings would be created in 7 to 9 types depending on the alternative selected. For a breakdown of how much in each type will be converted to early successional, stages, see Table H-5 and H-6.

Table H-5: Acres Cut in Each Timber Class by Alternative

Forest Class	Alt 1	Alt 2	Alt 2A	Alt 3	Alt 4	Alt 5	Alt 6
01	0	0	0	0	0	10	0
02	0	103	103	162	138	104	2.3
03	0	21	21	21	22	22	22
04	0	0	0	0	14	0	14
17	0	102	85	51	135	83	200
18	0	81	78	60	115	0	127
19	0	132	132	104	259	15	159
20	0	20	18	0	0	0	24
22	0	20	18	20	21	29	106
23	0	70	62	80	106	22	106

Table H-6: Percentage Total Proposed Harvest In Each Timber Class by Alternative

Class	1	2	2A	3	4	5	6
01	0	0	0	0	0	0.3	0
02	0	1.6	1.6	2.6	2.2	1.7	2.3
03	0	1.7	1.7	1.7	1.8	22	1.8
04	0	0	0	0	0.8	0	0.8
17	0	4.4	3.7	2.2	5.8	3.6	8.6
18	0	1.7	1.6	1.2	2.3	0	2.6
19	0	2.4	2.4	1.9	4.8	0.3	2.9
20	0	6.6	5.9	0	6.6	0	7.9
22	0	3.7	3.7	3.7	3.9	5.3	3.9
23	0	6.1	5.4	7.0	9.2	2.0	9.2

b. Heterogeneity and homogeneity within and between patches

I. Between Patches

Nearly all of the patches surrounding the cut patches are forested patches of Douglas-fir, mixed conifer and lodgepole pine. These patches range from even-age single species to multi-storied mixed conifer. Adjacent to cut patches 7, 10 and 13 are small patches of low density forest (type 40).

Of the four types of patches created in the action alternatives, clearcut patches would form the most discrete boundaries with adjacent forested patches. Shelterwood patches would be less dense with more regular tree spacing than adjacent forested patches. Both types would have less structure than some of the surrounding forest patches.

Clearcut with leave island patches would be more similar to surrounding forest patches by maintaining tree species diversity and structure. Modified irregular shelterwood would be the most similar to adjacent forest patches because of irregular patterns, multi-storied structures and tree species diversity.

Alternative 5 would have the greatest homogeneity to the existing landscape because it affects far fewer acres than the other action alternatives (see Table H-7). The patches created by Alternative 2A would have greater homogeneity to the natural landscape than other action alternatives because it creates a variety of patch types with varied structures and tree species.

Table H-7: Acres in Each Harvest Method by Alternative

TOTAL ACREAGE OF CUT PATCHES BY ALTERNATIVE							
ALTERNATIVES	1	2	2A	3	4	5	6
CLEARCUT PATCHES	0	410	20	255	645	124	186
CLEARCUT PATCHES W/ISLANDS	0	0	324	0	0	0	363
SHELTERWOOD	0	158	0	170	202	168	34
MODIFIED IRREGULAR SHELTERWOOD	0	0	158	0	0	0	168
TOTAL	0	568	502	425	847	292	168

Note: Alternative 2A will maintain 64 islands of 1/2-1 acre covering 58 total acres. Alternative 6 will have patches totalling 64 acres.

Alternative 4 affects the largest acreage and creates the greatest number of patches. Man-made patches range in size from 1 acre to 95 acres. Natural patches range in size from 8 acres to 2,545 acres for forest types that will be affected by this proposal. The openings created are within the size range of patches found in the natural landscape. Environmentally created patch sizes vary widely. The man-made patches proposed are smaller on average than those created by natural disturbances. The following table displays the minimum and maximum patch size of Alternative 4 which affects the largest acreage and creates the greatest number of patches.

Table H-8: Forest Class Size Averages (acres): Exising and Proposed Harvest

	Existing				Proposed	
	Min.	Max.	Mean	Std. Dev.	Min.	Max.
Forest Types Alternative 4						
2	8	604	86	104	8	88
3	8	233	77	56	22	22
4	13	326	66	62	4	10
17	30	842	212	247	4	40
18	23	1918	351	474	3	49
19	32	2545	389	644	1	60
20	17	114	38	30	2	15
22	25	103	60	23	21	21
23	8	285	89	87	18	42

Units 7, 10 & 13 share partial boundaries with patches of low density, forest type 40. Clearcut patches would be more homogeneous to the low density forest patches. Shelterwood patches would be more homogeneous in density to type 40 patches but heterogeneous in pattern. Shelterwoods have regular tree spacing , size and type.

Alternative 6 would also create patches that are similar to the existing forested landscape.

Alternatives 2, 3 and 4 would provide less homogeneity to surrounding forested landscapes than the other alternatives because the patches created in these alternatives form more discrete boundaries with surrounding forested patches.

Clearcuts with islands (found only in Alternatives 2 and 6) would create clearcut patches interspersed with small timbered patches (1/2-1 acre). This would increase heterogeneity with surrounding forested patches and increase homogeneity to non-forested patches of grasses, forbs and shrubs until they revegetate with trees.

Shelterwood patches would increase in heterogeneity to the surrounding forested landscape but less so than with clearcutting because would retain 15-50 healthy trees per acre. One story of trees would remain, so structural diversity would decrease when compared to the surrounding forested patches. Homogeneity to non-forested patches of grasses, forbs and shrubs would increase but less so than with clearcut patches.

II. Within patches

Four types of patches would potentially be created in the landscape: clearcut patches, shelterwood patches, clearcuts with islands and modified irregular shelterwood patches. For a breakdown of patch type and acreage created by alternative, see Table H-9. Alternatives 2,3,4,& 5 would have two types of patches created: clearcut patches and shelterwood patches. The patches created in these alternatives would be fairly homogeneous (little structure retained). Alternative 2A creates three types of patches and Alternative 6 creates four types of patches. These alternatives provide greater patch heterogeneity (more structure) because of the modified irregular shelterwood and clearcut with islands patches.

Table H-9: Acre Harvest from Each Forest Type by Alternative

Alternative	T. TYPE	MIN. CUT	MAX. CUT	SUM CUT	% T.TYPE CUT
2	2	5	34	103	1.6
2	3	21	21	21	1.7
2	17	6	30	102	4.4
2	18	2	19	81	1.7
2	19	1	36	132	2.4
2	20	2	3	20	6.6
2	22	20	20	20	3.7
2	23	5	24	70	6.1
2	40	1	1	4	0.1
2	60	4	5	13	0.2
2A	2	5	34	103	1.6
2A	3	21	21	21	1.7
2A	17	6	30	85	3.7
2A	18	2	15	78	1.6
2A	19	3	36	132	2.4
2A	20	3	15	18	5.9
2A	22	20	20	20	3.7
2A	23	5	24	62	5.4
2A	33				
3	2	4	90	162	2.6
3	3	21	21	21	1.7
3	17	13	38	51	2.2
3	18	5	15	60	1.2
3	19	1	33	104	1.9
3	20	2	2	2	0.1
3	22	20	20	20	3.7
3	23	7	24	80	7.0
4	2	8	88	138	2.2
4	3	22	22	22	1.8

Table H-9: Acre Harvest from Each Forest Type by Alternative (continued)

Alternative	T. TYPE	MIN. CUT	MAX. CUT	SUM CUT	% T.TYPE CUT
4	4	4	10	14	0.8
4	17	4	40	135	5.8
4	18	3	49	115	2.3
4	19	1	60	259	4.8
4	20	2	15	20	6.6
4	22	21	21	21	3.9
4	23	18	42	106	9.2
5	1	10	10	10	0.3
5	2	6	95	104	1.7
5	3	22	22	22	1.8
5	17	8	40	83	3.6
5	19	15	15	15	0.3
5	22	29	29	29	5.3
5	23	22	22	22	2.0
6	2	8	88	146	2.3
6	3	22	22	22	1.8
6	4	4	10	14	0.8
6	17	4	40	200	8.6
6	18	2	49	127	2.6
6	19	1	36	159	2.9
6	20	2	15	24	7.9
6	22	21	21	21	3.9
6	23	18	42	106	9.2

** values less than 2 acres have been dropped.

Note: Islands created in Alternatives 2A & 6 are 1/2-1 acre each and cover 10- 30 percent of the clearcut acreage shown.

Under the maximum harvest Alternative 4, 174 acres of Douglas-fir would be removed out of 12,768 acres in the landscape or 1.4 percent, 529 acres of mixed conifer of 12,990 acres or 4.1 percent, 127 acres of the 1,694 acres of lodgepole pine or 7.5 percent.

Clearcut patches would be the most homogeneous of the four types of created openings. These openings may retain a small number of trees and snags, but would convert the patch to a one-storied early successional stage of one type of tree.

Shelterwood patches would be less homogeneous than clearcut patches because overstory trees (15-50 per acre) would maintain some structural diversity. The patches would have two stories, while clearcut patches have one story.

Clearcut patches with islands would maintain the species diversity found in the surrounding landscape, by leaving healthy shade-tolerant species (Douglas-fir, subalpine fir and Engelmann spruce), individually and in islands. Islands of lodgepole pine would be retained where disease-free trees with a low downfall exist. These interior islands would range from 1/2-1 acre in size covering 10-30 percent of each opening. This would increase heterogeneity of the patch by maintaining structural diversity.

Modified irregular shelterwood patches would be similar in heterogeneity to clearcut patches with islands, but would likely provide the most structure of any of the create patch types. (Personal communication, Doug Basford) These patches would retain two-four storied structure as well as species diversity.

All cut patches will retain a minimum of 10 snags per 10 acres and 4 recruitment snags per 40 acres. (See Snag Guidelines in Table II-1, main document). All proposed cut patches will leave approximately 15 tons/acre of woody debris. Areas with islands, shelterwood and modified irregular shelterwood will also have a greater opportunity for snag recruitment than clearcut patches because they retain more standing trees per acre.

This is important when considering old forest structure, Harris states "The two habitat elements that contribute most to the habitat value of older forests are standing large, dead trees (snags) and fallen logs." (Harris, 1984, page 66).

Forested patches that have vertical diversity in the forest canopy will allow for better exchange of gases, more effective precipitation, greater amounts of solar radiation to reach the mid and understory levels. These factors allow vegetation growth throughout the vertical profile, which will permit herbs and shurbs to grow on the forest floor (Harris, 1984, page 19). This vegetation supports phytophagous (plant-eating) insects which are a support base for many insectivorous vertebrates. This can be very important in the spring and early summer, because virtually all forest birds are insectivorous or carnivorous (Harris, 1984, page 19). Also, vertical height distribution of foliage is widely accepted as a method of prediction for bird species diversity, and a more complex canopy structure may lead to greater bird abundance.

Harris found that, as greater foliage height diversity leads to a greater diversity of birds, a heterogeneous ground layer creates better habitat for cursorial (adapted for running) and fossorial (adapted for burrowing or digging) vertebrates. The understory and epiphytic vegetation is an essential component of wildlife habitat, especially in the Douglas-fir forests where diversity of flowering plants is low (Harris, 1984, page 21). Since vertically diverse forest canopies provide greater opportunity for understory vegetation to grow, flowering plants could have a greater presence under the diversified forest harvesting system than the clearcutting system. Harris states, "Angispermous (flowering) plants produce all of the nectar that is consumed by nectivores (e.g. hummingbirds) and the majority of fruits and seeds (mast) for granivores and omnivores." (Harris, 1984, page 21).

Below are listed the cutting prescriptions by descending order of height diversity:

Modified irregular shelterwood units
Clearcuts with islands
Shelterwood
Clearcut

The no action alternative will likely maintain the greatest height diversity of all the alternatives in the short term.

Action alternatives which favor the modified irregular shelterwood and clearcuts with islands cutting methods will result in patches that provide more foliage height diversity than alternatives that favor clearcuts and shelterwoods. Clearcutting reduces the vertical diversity to nearly nil during early development.

Of the major action alternatives, 2A would likely maintain the greatest height diversity of the action alternatives by cutting 382 acres of clearcuts with islands and 158 acres of modified irregular shelterwood with 20 acres of clearcutting in 4 patches. Alternative 6 would result in the second greatest level of height diversity of the major action alternatives.

Alternatve 4 would reduce vertical diversity the most of any alternative by clearcutting 645 acres. One layer of trees would be maintained in 202 shelterwood acres. Alternatives 2 and 3 are similar in cutting method but affect fewer acres.

Clearcuts will maintain 10 snags per 10 acres and 40 recruitment snags per 10 acres. (see Table 2-1 main document for snag guidelines) Shelterwoods will have potential for snag recruitment by retaining 15-50 mature trees per acre. Clearcuts with islands will allow for snag recruitment, particularly in the islands and also among the residual shade-tolerant trees. Irregular shelterwoods would likely provide the best opportunity for snag recruitment because of the variety of species, sizes and patterns retained.

Alternatives 2, 3 and 4 which are predominately clearcutting, with some shelterwood, (see Table H-7) would have the least potential for snag recruitment and downed woody debris, predominately in the shelterwood patches- Alternative 2, 158 acres; Alternative 3, 170 acres and Alternative 4, 202 acres.

Alternative 6 will allow for a moderate number of recruitment snags and downed logs because it creates a variety of openings: 186 acres of clearcuts, 369 acres of clearcuts with islands, 34 acres of shelterwood and 108 acres of modified irregular shelterwoods.

Alternative 2A will allow for more recruitment snags and downed logs than most of the other action alternatives (except Alternative 5), 20 acres of clearcuts, 324 acres of clearcuts with islands and 158 acres modified irregular shelterwood.

The potential for snag recruitment and downed logs will likely be highest for Alternative 5 because it affects the fewest number of acres (292) of all the action alternatives.

c. Boundary shape

The boundary shapes of the proposed openings are generally not similar to patches found in the existing landscape. The boundaries of the man-made patches are more geometric and form more discrete boundaries (more distinct edge) than patches created by fires.

d. Edge and edge effect

The edge effect would be most pronounced between forested and non-forested patches. All of the proposed cutting areas are predominately surrounded by forested areas. The exceptions are small portions of the boundaries of Units 7, 10 and 13.

The edge effect would be greatest in alternatives that create the largest number of clearcuts, particularly those with islands. Clearcuts with islands will also create a large amount of discrete edge since the islands will be discontinuous. This will create openings with interspersed forested patches of 1/2 to 1 acre.

The edge effect will be less discrete in shelterwood and modified irregular shelterwood than in clearcuts. The boundary will be forested to forested, with a change in type of forest patch.

Alternatives 2A will create the greatest number of discrete edges because of the 21 clearcut with island prescription, spanning 324 acres, plus the 4 clearcuts spanning 20 acres

e. Disturbance/recovery regimes

The disturbance/recovery regimes would vary by the method of proposed harvest. The disturbance/recovery process of clearcutting has some similar characteristics to a stand replacing fire. In a stand replacing fire all the trees are killed (Fischer and Clayton, 1983, page 43). With the clearcutting harvest method, the objective is also to kill all of the existing trees and then to reforest the area with young healthy trees.

One of the differences between the results of a clearcut and a stand-replacing fire is that the logging objective is to maximize removal of the trees to use for wood products. In the fire situation there may be standing dead trees (snags) left on the site as well as downed logs. In both clearcutting and stand-replacing fires, the forest would be reduced to a regeneration phase of succession.

More forest cover would remain with shelterwood or modified irregular shelterwood cuts. Cool to moderate understory patchy fires, kill some trees but leave the larger size and older trees, and create openings in the stand to allow for seedling growth (Fischer and Clayton, 1983, page 93). This is the same type of results that would result from harvesting with the irregular shelterwood method as proposed for the Douglas-fir ecosystems in Alternative 2A and 6, an open-forested or forested appearance would be left.

B. CORRIDORS ECOSYSTEMS

1. Stream corridors

   a. The length, width, nodes, heterogeneity and homogeneity of riparian strip corridors would not be affected by any of the proposed action alternatives, except where roads cross the riparian corridors.

   b. Disturbance/recovery regimes of stream corridors:

Roads crossing streams would be the only major disturbance to the stream corridors. Major stream crossings includes Goodluck Creek, Woodtick Creek, upper and lower Perm Creek and lower Salt Creek. Minor Creek crossings include two forks of an unnamed tributary of Woodtick Creek.

All of the action alternatives would cross Woodtick Creek via a drop (open-bottomed) culvert which would allow fish passage. Alternative 5 would have one stream crossing at Woodtick Creek.

All the action alternatives have strict mitigation measures to address disturbance/recovery of riparian corridors.

Trees in the roadways would not grow past seedling size. The road surfaces would not exceed 18 feet in width, and trees growing along the edge of the road would be allowed to mature, although, grasses and shrubs would grow on the edges of the roads, and some grasses in the center of the road.

2. Line corridors (roads).

Roads would be the only line corridors created by the action alternatives. The heterogeneity of the roads would be different by alternative. The new roads will all be permanent roads. Roads would be managed for periodic traffic use and grass and forb growth would be encouraged, but tree growth would be removed from the road surface. Revegetation would not occur on the planned permanent road surfaces, but would occur on fill slopes and much of the cut slopes.

Table H-10: Miles of Road Constructed or Reconstructed by Alternative.

Road Miles	Alt. 1	Alt. 2	Alt. 2A	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Constructed	0	16.8	16.8	14.6	17.8	1.15	17.8
Reconstructed	0	1.3	1.3	9.3	9.3	8.0	9.3
Total	0	18.1	18.1	23.9	27.1	9.15	27.1
Road acres	57	119	119	111	123	61	123

a. Homogeneity of line corridors

The homogeneity of roads would be high. They would be primarily unvegetated with some grass and forb encroachment. They would be maintained to keep trees from growing in the travel way.

b. Disturbance/recovery regimes of line corridors

Permanent roads would disturb the ecosystem on 4 to 66 additional acres. Some grasses and forbs would encroach on the edges of the road and in the center, but recovery would be incomplete since any trees that encroached into the running surface would be removed. The last 1/2 mile of Road #60286.1 and all of roads #60286.2, 60286-C and 60288 will be covered with slash piles five years following timber removal in Alternatives 2, 2A, 4 and 6. The mileage of the slash-covered roads totals approximately 6.5 miles. These roads would have little additional disturbance but would likely not revegetate because of the density of slash.

C. MATRIX ECOSYSTEM

III. PATCH AND CORRIDOR FUNCTION WITHIN THE LANDSCAPE

A. PATCH ECOSYSTEM FUNCTION

The matrix would remain Douglas-fir and mixed conifer up to 9 inches.

1. Connectiveness of patches

Non-forested or low density open forest patches cover approximately 27 percent of the Moyer Salt Landscape. These range from closed boundary island patches at higher elevations as small as 2 acres to large patches up to 2,053 acres below 7,500 feet and on south-facing slopes.

Alternative 2A will create 64 patches of 1/2 - 1 acre, totalling 58 acres.

Alternative 6 will created 73 patches of 1/2 - 1 acre, totalling 64 acres.

T&E, P, and S as related to patch connectivity

All of the cutting units proposed in the action alternatives would result in decreased connectivity in forested types. The effect would be greatest in portions of Alternatives 2, 3, 4 and 6 where patches of habitat would be clearcut or clearcut leaving discontinuous island patches. Alternative 5 would be the least disruptive to patch connectivity (of the action alternatives), because it affects the fewest acres.

Gardner et al. (1987) have shown that the threshold for habitat modification below which negative effects to connectivity occur in a landscape is about 60 percent. None of the TEPS species which occur in the analysis area are known to be dependent on Douglas-fir communities. However, goshawks select mature to "over-mature" conifers (including Douglas-fir) with a closed canopy as nesting stands (Hayward and Escano 1989). The Biological Evaluation for goshawks (Appendix G1) has indicated that, while nesting habitat would be lost when the mature Douglas-fir units are harvested, population viability for this species on the Salmon National Forest would not be jeopardized.

2. Porosity of Ecosystems

Porosity related to genetic variability

Forman and Godron (1986, pg 170) have stated that porosity can provide an indication of the degree of species isolation present and a clue to the potential genetic variability present within populations of animals and plants in a landscape. All action alternatives would increase the patchiness of the landscape (Forman and Godron, 1986, pg 207) and result in a more porous matrix (Forman and Godron, 1986, page 168). Porosity is a measure of the number of patches, regardless of size. (Forman and Godron, page 170)

Alternative 2A would add the greatest number of patches. Thirty two major patches would be added plus the 64 additional patches created in the islands for a total of 96 new patches. Alternative 6 would add 30 major patches plus 73 one-half to one acre island patches. Alternative 5 would create 7 patches, the fewest number of patches of the action alternatives. Alternatives 2, 3 and 4 would created 32, 25 and 29 patches respectively.

Table H-11 lists the calculated matrix porosity for each alternative as measured by patch numbers.

Table H-11: Porosity As Measured by Patch Numbers

Description	Alt. 1	Alt. 2	Alt. 2A	Alt. 3	Alt. 4	Alt. 5	Alt. 6
Forested	416	423	423	425	420	419	420
Non-forested	228	253	253	244	253	232	254
TOTAL Patches	644	676	676	669	673	651	674

Note 1: Clearcuts were considered non-forested and shelterwoods were considered forested patches for this table.

Note 2: Alternative 2A would create 64 island patches of 1/2-1 acre. Alternative 6 would create 73 island patches of 1/2-1 acre. These are not included in the above totals.

3. Flow

The flow that occurs within and between landscapes is partially a function of porosity. The predicted increase in porosity (by timber cutting) ranges from 1 percent in Alternative 5 to 5 percent in Alternatives 2, 2A and 6.

The rate of flow of objects in and through a landscape, termed landscape resistance, is partially a function of the boundary crossing frequency (BCF) and boundary discreteness (Forman and Godron 1986). It is hypothesized that flows of wind, water, and locomotion are generally slowed by crossing boundaries. Boundary crossing frequency can be a general indicator of landscape resistance (Forman and Godron 1986).

Forman and Godron (1986) suggest that they expect animals and plants are inhibited more by a highly discrete (abrupt) boundary than by a gradual boundary. Therefore, our analysis has incorporated boundary discreteness into the calculations for boundary crossing frequency. Three classes of boundaries were considered when calculating the boundary crossing frequency: forested/forested, non-forested/non-forested and forested/non-forested. The forested/forested and non-forested/non-forested boundaries were considered gradual; forested/non-forested boundaries were considered discrete (abrupt).

For the proposed actions in this landscape, direct effects of the action alternatives are concentrated between 6,800 and 8,400 feet elevations. Thus, a boundary crossing frequency (BCF) analysis was completed by counting the number of boundaries crossed by each mapped contour line at the 6800, 7200, 7600, 8000 and 8400 foot contours for each alternative (Table H-12). Road rights-of-way were not included in the count.

Table H-12: Boundary Crossing Frequency by Alternative

Elevation	Boundary Type	ALT 1 (No Action)	ALT 2	ALT 2A	ALT 3	ALT 4	ALT 5	ALT 6
6800	F/F	52	52	52	52	52	52	52
	F/N	61	61	61	61	61	61	61
	N/N	14	14	14	14	14	14	14
7200	F/F	63	63	63	63	63	63	63
	F/N	59	67	67	63	71	67	17
	N/N	7	7	7	7	7	7	7
7600	F/F	76	76	76	76	76	76	76
	F/N	43	63	63	20	55	49	55
	N/N	1	1	1	1	1	1	1
8000	F/F	47	47	47	47	47	47	47
	F/N	42	52	52	54	48	42	56
	N/N	2	2	2	2	2	2	2
8400	F/F	19	19	19	19	19	19	19
	F/N	68	74	74	72	78	68	76
	N/N	1	1	1	1	1	1	1

Because of the importance of the effects of forested/non-forested boundaries on the surrounding ecosystem processes, Alternatives 4 and 6 would have the greatest effects on flow between boundaries. Alternative 2 and 2A, the next greatest effect, then Alternative 3 and Alternative 5 would have the least effect of the action alternatives.

The **mature structure characteristic** forest patches (including old growth) are the patches that would show the greatest change in porosity and edge. This shift may yield changes in flow of species and energy across and between the patches. The greatest effects would be between non-forested and forested ecosystems.

Of the four patch types proposed in the action alternatives, modified irregular shelterwood patches will likely retain the most mature structure characteristic forest patches. Shelterwood patches will retain 15-50 mature trees per acre but will not retain other canopy layers in the forest. Clearcutting with island patches may retain some mature trees in the one-half to one acre islands. Clearcutting will remove nearly all mature trees except those needed for snags and snag recruitment.

In some stands, maintaining the current condition will maintain the most mature structure characteristics.

Alternatives 4 will likely reduce the mature structure characteristics forest patches the greatest because it uses the clearcut and shelterwood methods - 25 patches totalling 645 acres clearcut and 4 patches totalling 202 acres.

Alternatives which cut fewer acres (Alternative 5) or use mainly the modified irregular shelterwood method (Alternative 2A) would have less influence on the flow of materials, energy and life forms than the clearcut systems of Alternatives 2, 3 and 4.

Alternative 6 cuts the second largest number of acres (751) with 186 acres of clearcuts, 363 acres of clearcuts with islands (the acreage of the islands is not reflected in the total), 34 acres of shelterwood cuts and 168 acres of modified irregular shelterwood.

a. Boundary function

I. Edge

Three boundary function situations need to be addressed for the range of alternatives presented in this EIS: non-forested/forested edge, forested/forested edge and no change in edge condition.

A newly-created edge within a timber stand (forested/non-forested edge) would have the greatest effect to the ecosystems involved. It is known that the trees of a forest influence the wind and shade patterns and thus snow deposits and plant survival in an adjacent opening (J. Kimmins, 1987). The amount of influence depends on environmental factors, like slope, aspect, elevation, soil type, vegetative cover, climatic conditions and weather patterns.

Along the edge of a non-forested area (like the clearcuts proposed in all of the action alternatives) snow and tree seeds would accumulate, and a micro-climate, moderated in the following two ways by the adjacent forest, would be produced. First, a greater accumulation of snow would occur because the trees along the edge would produce a "snow-fence" effect trapping snow throughout the winter. Second, because of shading and decreased wind, less evaporation would occur. Both of these processes would tend to increase the effective precipitation along the edges of the clearcuts. The moderated micro-climates, in conjunction with the increased seed and spore accumulations, would generally result in more vegetation.

Many life forms use openings and edges of openings in addition to other habitats as a "source" (Forman and Godron 1986) for obtaining food. Some use the opening only during specific times (night, winter, summer, not during hunting seasons, etc.). Others are found in openings and not elsewhere.

Interior species are species that do not use edge or openings. An excess of edge could likely exclude interior species from that landscape. There are four mature forest types present in the landscape. These are: type 1 - Mature Douglas-fir (below 45-60 percent slopes), type 3 - Mature Douglas-fir (above 45-60 percent slopes), type 17 - Mature mixed conifer (below 45-60 percent slopes) and 21- Mature lodgepole.

Of these four forest types, timber cutting is proposed in the first three in some of the alternatives. Ten acres of type 1 are proposed in Alternative 5. Out of 16 patches of type 3, totalling 1,128 acres in the existing landscape, timber harvest is proposed in one patch (Unit 30) in each of the action alternatives. The size of the cut patch would be 21 acres in Alternatives 2, 2A and 3 and 22 acres in Alternatives 4, 5 and 6. This patch would cut the center portion of a 79 acre mature forest Douglas-fir patch. The cutting method would be shelterwood in Alternatives 2, 3, 4 and 5 and modified irregular shelterwood in Alternatives 2A and 6. Alternatives 4, 5 and 6 would cut an adjacent 22 acres of small lodgepole pine. Approximately 2 percent of the mature Douglas-fir in the landscape would be cut.

The largest amount of mature timber would be cut in the type 17 - mature mixed (subalpine fir, engelmann spruce and/or lodgepole pine) conifer. There are 11 patches totalling 2,327 acres of this type in the Moyer Salt Landscape.

Alternative 4 cuts the most of any action alternative in this type. Three existing landscape patches would be affected: a 49 acre patch, a 541 acre patch and and 842 acre patch. Thirty acres of the 49 acre patch, 77 acres of the 541 acre patch and 106 acres of the 842 acre patch would be clearcut in patches ranging in size from 4 to 40 acres.

This would remove 9.1 percent of the mature mixed conifer type from the landscape. The effects of this are not known.

Alternative 6 would cut 8.1 percent of the mature mixed conifer type from the landscape. This would be primarily in clearcuts with islands totalling 188 acres. Alternatives 5 and 2A would cut the least of this type with 3.6 percent and 3.7 percent respectively.

For acreage information on the other alternatives, see Table H-9.

Historically, the disturbance pattern for this landscape has been the occurrence of stand modifying or stand-replacing events such as fire or insect epidemics. Fire generally results in either a stand replacing or partial stand replacing event. The effects of a stand-replacing fire would have some common characteristics of a clearcut, since a stand-replacing fire would set the stand succession back to a grass/forb seral stage and so would a clearcut. Clearcuts with islands would be more similar to moderate intensity fires because they leave scattered patches of live trees. Shelterwood cuts would be more similar to the effects of lower intensity fires that retains some of the larger, more fire resistant Douglas-fir or lodgepole pine trees while removing the smaller Douglas-fir and lodgepole pine as well as the less fire-resistant subalpine fir and engelmann spruce. Modified irregular shelterwoods would be similar to low intensity fires.

A major determinant in the amount of effect an edge has is how much heterogeneity exists between patches. This is related to boundary discreteness. A forested to non-forested boundary likely has the greatest effect. More edge effect may be created in alternatives employing modified irregular shelterwood cutting methods but the boundaries are less distinct than a clearcut surrounded by mature forest.

ii. Source and sink

On a broad scale, the results of a source/sink relationship in a landscape can be seen in the productivity levels of the different ecosystems which make up the landscape. For a given landscape, the ecosystems which have higher productivity (older forests, riparian areas and northslope forests) are generally the sinks of energy, materials and biota (Forman and Godron, 1986, Harris, 1984,)

Alternative 4 and 6 have a higher possibility of effecting the source/sink relationship for species that may be dependent on mature mixed conifer forest and mature Douglas-fir forests than the other action alternatives. Alternative 4 cuts 22 acres of mature Douglas-fir forest (forest code 3) and 225 acres of mature mixed conifer forest (forest code 17) by clearcut or shelterwood methods. Alternative 6 cuts 22 acres of mature Douglas-fir forest and 188 acres of mature mixed conifer forest using the four methods previously described.

Alternative 3 cuts the least mature forest, 21 acres of Douglas-fir mature forest and 51 acres of mixed conifer mature forest.

Alternatives 2, 2A and 5 cut 21 to 22 acres of Douglas-fir and 102 acre, 85 acres and 83 acres of mature mixed conifer forest, respectively.

b. Energy

Considering the size and the spatial representation of the proposed harvest units, it is unlikely that energy vectors (wind, surface water or subsurface water flows) would be affected greatly by any of the proposed action alternatives. Surface and/or sub-surface water flows will likely increase because of increased snow accumulation, particularly in clearcut areas. Additional water will be available below cut patches. This will be taken up by trees downhill of cut patches, facilitating increased growth and vigor or will reach streams as subsurface flow, helping to maintain seasonal flow.

C. CORRIDOR ECOSYSTEM FUNCTION

1. Riparian corridors

Direct effects to the riparian corridors would primarily be the road crossings of Woodtick, Salt, Perm and Goodluck creeks with two minor crossings of an unnamed tributary of Woodtick Creek. No cutting units would be located within the 75 foot filter strip either sides of the creeks. For location of cutting units, see alternative maps.

a. Boundary Function

i. Airborne flows

(a) Energy, nutrients, and materials

Where the proposed roads would cross streams, vegetation would be removed, resulting in a break in vegetation. Woodtick Creek is the only major Creek that would be crossed. The vegetation would be removed for a width of approximately 30 feet to allow for drop culvert construction. Any break in the vegetative cover can alter airborne, surface and soil flows of an ecosystem, affecting distribution of energy, nutrients, materials, animals and plants.

The road crossing of Woodtick Creek would occur in conifer type riparian ecosystems. These ecosystems are subject to a variety of disturbances in the natural processes. It has been found that these ecosystems will burn in the dry season of the year. Generally, wet and moist spruce forest conditions will result in a low fire susceptibility (Hansen 1988). Ground fires that smolder and that have restricted size probably occur most often and may result in the removal of small groups of trees. Rarely are entire stands or whole drainage bottoms killed by one fire event in these wet ecosystems (Bradley 1992). Even though it does not occur as often, fire may be more severe in its effects to the wet forest ecosystems because of higher site productivity (higher organic build up) and because rhizomes and seeds of undergrowth are vulnerable to the high temperatures of smoldering fires in heavy organic material (Bradley 1992). Spruce trees themselves have a low resistance to fire because of their dead, dry, flammable lower limbs, low growing canopy and thin bark (Hansen 1988). Bradley (1992) states, "Englemann and blue spruce are shallow rooted trees, and even low fires may kill trees outright or weaken roots and make trees susceptible to later windfall. Unusually hot, windy weather may reduce fuel moistures enough to sustain a severe fire. At all stages the site will then return to a treeless condition" (Bradley 1992). Considering the vulnerability of these ecosystems to fire and other disturbance agents, it is probable that species occurring in coniferous forest riparian communities in the Moyer Salt Landscape are adapted to vegetative and soil disturbances that are larger than the proposed road crossings.

(b). T&E, P, and S

Riparian corridors (riparian zone and adjacent meadows) are important as foraging areas for western big eared bats, great gray owls and goshawks and as such serve as pathways for the movement of

these airborne species. The road systems proposed in all of the action alternatives would cross several riparian corridors. Alternative 5 would cross one riparian corridor and the other action alternatives would cross five. It is not known if or how riparian corridor crossings would affect potentially occurring T&EPS species in the landscape. However, a small reduction in foraging habitat would occur since small areas of riparian habitat would be covered by road surface.

ii. Overland flows

(a) Energy, nutrients, and materials

Some stream corridors would be crossed by roads, resulting in small amounts of sediment (nutrients and overland water flows) reaching the stream until the disturbed soil stabilizes in approximately two years (personal communication, Betsy Rieffenberger, Feb. 26, 1993). (Also see Water resource analysis, Ch. IV.)

It does not appear that the alternatives would affect the wind relationships in the riparian corridors.

As with airborne flows of vertebrates and invertebrates, the effect on the movement of species probably is related to the size of the home range of the animal concerned and how adapted to crossing diverse habitats it is. Animals with comparatively small home ranges or which are restricted to one habitat type would be most affected. Those that have home ranges larger than the width of the road disturbance and could use disparate habitats would be little affected by roads crossing riparian areas. Presently, there are no data to suggest that genetic isolation of species which inhabit landscapes like the Moyer Salt Landscape would occur as a result of road crossings of this size of riparian areas.

(b). T&E, P, and S

Cursorial animals like wolves and lynx use riparian corridors to move between suitable habitat patches as well as for foraging. In addition, spotted frogs are tied to riparian corridors throughout most of the year. All of the action alternatives would result in at least one riparian corridor crossing. The other action alternatives will have five riparian crossings. All of the newly constructed roads will be gated and vehicle access by the general public will be restricted.

If vehicle access were unrestricted, we could expect that the increase in human activity at riparian corridor crossings could alter both the use of these travel corridors and the mortality of wolves, wolverines and lynx since all are known to be sensitive to human pressure or are harvested species (Hornocker and Hash 1981; Mech et al. 1988; Idaho Department of Fish and Game 1992). However, since there will be restrictions on access, we expect the effects to be lessened to wolves, wolverines and lynx.

The effect, if any, of riparian corridor crossings on spotted frogs is not known. The Biological Evaluation for these species (Appendix E) has indicated that their viability would not be jeopardized by these proposals.

iii. Soil flows

The action alternatives would only affect soil flows at the riparian corridor crossings. Mitigation measures which apply to all action alternatives would greatly reduce any soil movement at these locations.

iv. Aquatic

For all of the action alternatives except Alternative 3, mitigation measures associated with the proposed stream crossings of affected creeks are designed to continuously maintain migration opportunity for all species of fish (including TEP&S) currently or potentially using project area waters. Alternative 3 could result in degraded fish habitat as a result of the proposed road location and the Salt Creek crossing.

For Alternatives 1, 2, 2A, 4, 5, and 6, no shifts or change in fish species distributions or population numbers would be expected as a direct, indirect, or cumulative result of proposed vegetation management activities. All opportunities currently available to promote the genetic variability of resident fish stocks within Woodtick, Salt and Perm Creek drainages would be maintained during and after implementation of proposed activities.

b. Source and sink

Due to the limited scale of the disturbance to riparian corridors that would occur from any of the action alternatives, there would be no noticeable effects to the source/sink function of the riparian corridors of this landscape.

2. Non-Riparian Corridors

a. Strips Corridors

i. Barrier/filter:

(a) T&E, Proposed and Sensitive

Of the T&EPS species that occur in the analysis landscape only the goshawk is dependant on old growth habitat. Most other listed species either use other habitats or their life histories are so poorly known that it is not possible to predict what habitats are barriers or filters for them.

The timber harvest practices proposed in all of the action alternatives would convert some habitat which is currently available for nesting by goshawks to areas that could only be used by them for foraging. The irregular shelterwood harvesting practices proposed in Alternatives 2A and 6 would retain some old growth character in the cutting units although the volume cut would vary with alternative. But, the resulting stands probably would be unsuitable for nesting by goshawks (Crocker-Bedford 1990). It is not known how the habitat changes associated with this harvest method would affect use of the areas by goshawks for foraging or other T&EPS species.

b. Lines Corridors

The only line corridors that would be created by the proposed timber sale are roads. The roads proposed in the action alternatives would be used by some animals as travel routes to move across the landscape. Roads would also be used by humans for vehicle and foot travel (except for the 6.5 miles that would be covered with slash in Alternatives 2, 2A, 4 and 6). Given the dense nature of the forested north sloped ecosystems within the landscape, roads could make available ecosystems or portions of the landscape that were not available in the existing landscape.

In addition, roads would become invasion routes for some pioneer and some exotic plant species, and some plant seeds could be carried along the roads by animals, humans or vehicles.

l. Barrier/filter

(a) General animals and plants

The disturbance associated with the road (clearing of vegetation, cut and fill slopes) **may** function as a barrier to animals or plants with home ranges that are smaller than the road width or that are not adapted to crossing disparate habitats.

Although isolation of a population could result from barriers and is a concern for genetic diversity. Allendorf found that the genetic flow process was not as fragile as some may have believed, he states that low amounts of exchange (approximately one individual per generation) will maintain the presents of the same alleles in all demes, that is qualitative similarity among demes, but much larger amounts of exchange are required to maintain quantitative similarity among demes (F. Allendorf, 1983, page 55, 64).

Two to seven years after construction of the roads proposed in the Moyer Salt Landscape, most of the fill slopes would be revegetated and, depending on the steepness of the terrain, so would the cut slopes (when not prohibited by rock). Once the cut and fill slopes are revegetated, only the running surface of a road that receives unrestricted and moderate to heavy use would be totally absent of vegetative cover. For the roads being considered, the running surface would be approximately 14 feet in width. It should also be considered that much of the year these roads would have a complete covering of snow, which can assist small animals to move beneath the snow surface, visually undetected by predators.

Even small vertebrates (mice, voles and shrews) have home ranges which exceed the considered road width of 14 feet. For example, Harris (1984) who summarized data collected from other parts of the United States found that the white-footed vole, deer mouse, and the Pacific jumping mouse all have home ranges of approximately 80 feet in diameter. He further indicates the northern flying squirrel, dusky shrew, and the mantled ground squirrel have home ranges of approximately 200 feet.

Species that have home ranges larger than the road disturbance areas or that are adapted to cross inhospitable habitats probably would not be affected. Road crossings would be engineered so that they are not barriers to aquatic species.

Therefore, roads would not be expected to be barriers to species in the Moyer Salt Landscape.

(b) Aquatic

See the discussion above under **Aquatic**.

(c) T&E, Proposed and Sensitive, MIS

The only line corridors that would result in the analysis area from the proposed alternatives are roads. Several potential barriers could be created by the road systems proposed in the alternatives, as well. Wolves, wolverines and lynx are sensitive to human activity or are harvested species (Hornocker and Hash 1981; Mech et al. 1988; Idaho Department of Fish and Game 1992). The presence of roads, especially in riparian areas, could act as a barrier to these species. However, since the roads would not be left open year round to the public, it is less likely that the roads would function as barriers to the movements of cursorial T&EPS species. Other TEPS species either do not use the habitats (or elevations) in which these proposed activities are located or are not known to avoid roads.

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